

Guidelines

for the sustainability
of cruises & recreational
boating in the
Mediterranean region

— April 2022

*Project co-financed
by the European Regional
Development Fund*

This report has been edited by Plan Bleu
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ACKNOWLEDGEMENTS:

This publication has been made possible through the work of the working group members who are listed at the end of the report. Hence, we would like to thank the stakeholders for contributing to the elaboration of this report. Their contributions were highly appreciated and helpful regarding their experience and professional expertise.

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Preferred citation: *Plan Bleu (2022) Guidelines for the sustainability of cruises and recreational boating in the Mediterranean region, Interreg MED Blue Growth Community project.*

Cover design and layout by *Studio3615*
Copy-editing by *Connected Languages Services*

EAN : 9782912081575

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Executive summary

The Mediterranean is the world's second largest cruise destination. With EUR 57.3 billion of economic impact and 8 million passengers, the cruise sector plays an important role in the economies of Mediterranean countries. The recreational boating industry across Europe is made up of 32,000 companies, with over 95% SMEs, and around 280,000 direct employees.

Europe's two largest markets for recreational boating are located in France and Spain, which, along with Italy, account for 80% of total demand in the Mediterranean region. The sector generates revenues and employment with a positive economic impact on local communities. Although their sustainability standards have considerably increased, the significant increasing trends of these sectors, along with several common practices in the sector, pose a serious threat to Mediterranean marine and coastal ecosystems.

Tracking global trends shows that the number of cruise passengers is considerably increasing, while marinas are generally close to full capacity, especially in summer. The 2020 pandemics marked a strong interruption of growing trends, but the Mediterranean will likely rapidly resume its role in maritime tourism. Though cruising and recreational boating are quite different sectors and each of them includes several specificities (large and small cruises, small leisure boats, smaller and larger yachts), they are currently

facing similar challenges to achieve the transition towards environmental and social sustainability, as set out in several policies and strategies at the Mediterranean, European and international level.

In the framework of the Interreg MED Blue Growth Community and in line with its mandate to work on regional tools for sustainable tourism, Plan Bleu committed to producing guidelines for the sustainability of cruises and recreational boating in the Mediterranean region. These guidelines were developed on the basis of outputs produced by specific projects from three Interreg MED Communities dealing with cruises and yachting (the Blue Growth Community, the Sustainable Tourism Community and the Mediterranean Biodiversity Protection Community), with the contribution of a multi-stakeholder group set up for this purpose (cf. Annex) and also relying on the work carried out under the BlueBoatsMed project, from the BlueMed Initiative.

These guidelines aim to:

- *Provide an analysis of the impacts of the cruise and recreational boating sectors;*
- *Report on good practices to enable the sustainable development of both sectors, addressed to the direct stakeholders;*
- *Provide avenues of reflection for policymakers and the competent authorities to legislate and limit pollution in the above sectors.*

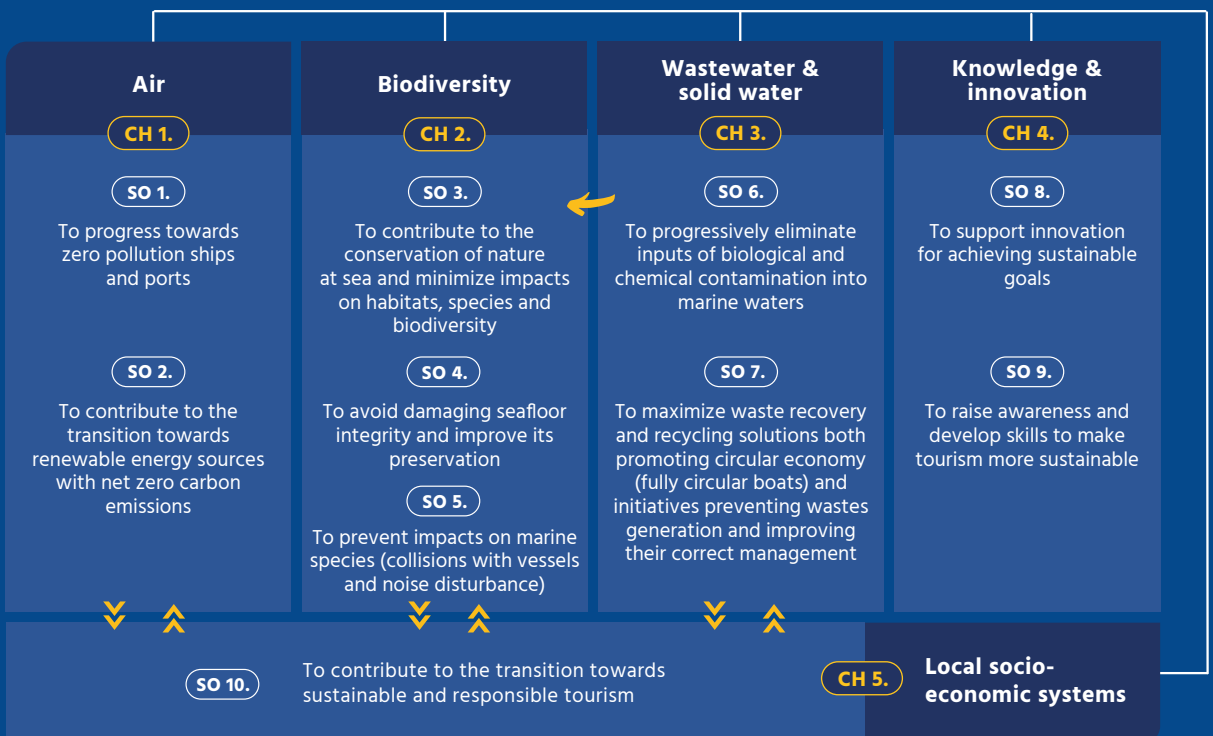
These guidelines refer to cruising and recreational boating (as activities at sea) and ports and marinas (as shore-side activities). For these sectors and sub-sectors, five major sustainability challenges were identified:

- *Eliminating air emission of pollutants and greenhouse gases (CH1);*
- *Safeguarding ecosystems and biodiversity (CH2);*
- *Eliminating inputs of water pollution, preventing waste generation and improving its management (CH3);*
- *Boosting knowledge and innovation (CH4);*
- *Avoiding impacts on local socio-economic systems (CH5).*

These challenges are structured around ten highly interconnected Sustainability Objectives (SOs) that constitute the general vision for the sustainable transition of cruising and recreational boating in the Mediterranean (cf. Figure below).

Objectives are intended to be reached through a progressive approach: as far as possible they should be implemented in the medium term (2030), aiming for full implementation by 2050.

Diagram showing the interrelations among different sustainability objectives



The stakeholders engaged to develop these guidelines (representatives of port authorities, the cruise business, local authorities, boating industry, scientific research, environmental associations, tourism observatories, MPA managers, environmental and tourism consultants) revealed that cruising and recreational boating have different viewpoints about the most pressing objectives. While zero air pollution and net zero carbon emissions (SO1, SO2) are considered as the most relevant objectives for cruising, those related to the conservation of habitats and species and to the preservation of seafloor integrity (SO3 and SO4) are perceived as more important by the recreational boating sector. However, the net zero carbon emissions objective is considered hardly feasible by the cruising sector, while all objectives are almost equally feasible for recreational boating, revealing a high potential for their implementation, especially towards the objectives of the circular economy and the preservation of seafloor integrity.

In recent years, good practices have been increasingly put in place and shared across Mediterranean countries, providing tools to reduce the environmental impacts and to enhance the social sustainability of the cruising and recreational boating sectors. Based on a literature review and the stakeholders' engagement, these guidelines propose a catalogue of 68 practices, tackling the five challenges identified and the related sustainability objectives.

Practices related to the gradual replacement of fossil fuels with new alternatives (low carbon, low pollutant) fuels emerged as one of the most relevant solutions for cruising, targeting one of the greatest challenges of the sector (CH1, Eliminating air emission of pollutants and greenhouse gases). Energy-

saving solutions (more efficient engines or optimised ship design) are complementary and promising solutions. Technical innovation is a key leverage factor for such practices, along with the availability of adequate economic resources, mainly if the practices require major infrastructure renovation. The reduction of noxious gas emissions, expected by the implementation of these practices, helps to lessen the sector's impact on the health of coastal communities.

A large and heterogeneous group of measures tackles the challenge of safeguarding ecosystems and biodiversity (CH2). Practices include spatial measures (e.g. no-anchoring areas), regulatory measures (e.g. speed reduction) and monitoring activities that can involve cruise companies or recreational boating associations. Marine Spatial Planning, which allocates areas for future human activities and the space deserving of marine protected areas, can foster the implementation of spatial measures that respond to this challenge, minimising environmental impacts and social conflicts. The real engagement of local communities in the planning and decision-making, as well as training, fiscal and educational initiatives, are key to increasing user acceptance of imposed measures.

The third group of practices refers to management options for solid and liquid waste generated by cruising and recreational boating, along with practices that favour the circular economy (CH3). They include technological applications for on-board water treatment, the use of eco-friendly cleaning and anti-fouling products. Practices also refer to the management of boats' end-of-life (or end-of-use) and to possible fiscal measures that incentivise reduced waste production, both for ships and for ports and marinas. Technical innovation is essential

to apply some of these practices, as well as the availability of adequate economic resources.

Practices that respond to the challenge of boosting knowledge and innovation (CH4) include those addressing the need for increased digitalisation in the sector (e.g. development of mobile apps, smart marinas) and training and education (e.g. mandatory training in boat permit courses), which can be important to avoid environmental impacts caused by inexperienced manoeuvres and irresponsible behaviour. Environmental certification systems for ports and marinas, as well as the use of economic incentives to develop sustainable activities, are also included in this group of practices. The creation of new and qualified jobs can be an added value associated with this group of measures.

The last group of practices includes actions that minimise the impact of mass tourism on local communities and offer the equitable distribution of the benefits from tourism (CH5). This group embraces actions to be implemented mainly on the shore-side, by involving the local authorities and economic operators of coastal municipalities. New solutions to develop quotas on arrivals, enhance sustainable local mobility, eco-tourism offers, or interactive smart tools that encourage tourists to reach inland cultural heritage sites can help achieve the sustainability objectives. Their effective implementation requires a good prior knowledge of the socio-economic impacts of nautical tourism and the tourist carrying capacity of the destination territory as well as the level of social acceptability.

To help stakeholders in the boating and cruising sectors prioritize actions to be implemented, a selection of high-impact

practices has been made for each sustainability challenge and by sector (cruising, boating, ports and marinas) based on their high potential for dissemination and significant reduction of environmental impacts.

At last, four case studies complete these guidelines, providing concrete examples of implementation of a single practice or a set of practices in different locations in the Mediterranean.

List of Acronyms

- ACCOBAMS** – Agreement on the Conservation of Cetaceans of the Black Sea, Mediterranean Sea and Contiguous Atlantic Area
- AFNOR** – Association Française de Normalisation
- CE** – European Council
- CH** – Challenge
- CNR** – National Research Council (Italy)
- CO** – Carbon monoxide
- CO₂** – Carbon dioxide
- COP** – Conference of Parties
- CSA** – Coordination and Support Action
- EC** – European Commission
- ECA** – Emission Control Area
- EcAp** – Ecosystem Approach
- EMAS** – Eco-Management and Audit Scheme
- EPR** – Extended Producer Responsibility
- ESPO** – European Sea Ports Organisation
- EU** – European Union
- EUR** – Euro
- FRP** – Fiberglass-Reinforced Polymer
- GES** – Good Environmental Status
- GHG** – Greenhouse Gas
- ICZM** – Integrated Coastal Zone Management
- IMO** – International Maritime Organization
- LNG** – Liquefied Natural Gas
- MEPC** – Marine Environment Protection Committee
- MPA** – Marine Protected Area
- MSFD** – Marine Strategy Framework Directive
- MSP** – Marine Spatial Planning
- MSSD** – Mediterranean Strategy for Sustainable Development
- NGO** – Non-Governmental Organisation
- NO_x** – Nitrogen Oxides
- OECS** – Other Effective area-based Conservation Measures
- PERS** – Public Employees' Retirement System
- PM** – Particulate Matter
- SCP** – Sustainable Consumption and Production
- SDG** – Sustainable Development Goal
- SECA** – Sulfur Emission Control Area
- SGMF** – Society for Gas as a Marine Fuel
- SME** – Small and Medium Enterprise
- SO** – Sustainable Objective
- SO₂** – Sulfur dioxide
- SWD** – Staff Working Document
- TBL** – Triple Bottom Line

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01 Introduction



The Interreg MED Blue Growth Community project pursues the ambitious objective of facilitating the development of a sustainable blue economy in the Mediterranean region. As a partner of the Blue Growth, Biodiversity Protection and Sustainable Tourism communities, and in line with its mandate to work on regional tools for sustainable tourism, Plan Bleu committed to producing guidelines for the sustainable development and management of the cruising and recreational boating sectors in the Mediterranean.

Cruising and recreational boating can generate impacts on the marine environment and society, at sea, during navigation, and on land when ships and boats are stationary in ports or marinas and tourists disembark to visit coastal cities and further inland. Though differences exist between cruising and recreational boating and between larger and smaller vessels, these sub-sectors of maritime tourism face similar challenges to meet more stringent legislative requirements and to achieve the sustainability objectives set by international and national policies, strategies and agreements.

Air emissions from fuel combustion, wastewater discharge, anti-fouling and hydrocarbon releases into seawater, collision events with marine megafauna, underwater noise and the alteration of seafloor integrity are among the main environmental impacts to which cruising and recreational boating contribute. It should

be noted that the cruise and recreational boating sectors do not contribute in the same proportions to the various impacts mentioned above. Social impacts include overcrowding of coastal tourism destinations, a decrease in liveability and the well-being of residents, disruption of local economies not based on tourism, and landscape and seascape degradation. Alongside these issues, several local initiatives, as well as technological solutions, have the potential to significantly reduce such impacts. In recent years, many good practices have been increasingly put in place and shared across Mediterranean countries, opening the pathway towards the environmental and social sustainability of these sectors.

Recognising the specificities of each sector (cruise, small recreational boats and large yachts), but also their common challenges and objectives, these guidelines highlight the key importance of sustainable approaches and actions to minimise their environmental impacts, maximise the socio-economic benefits for local communities, ensure a balanced distribution of the benefits, and improve effective collaboration between all actors involved (national and local administrations, port authorities, cruise companies,

boat owners and their associations, tourists, citizens, NGOs, research institutions, MPA managers, etc.). Ultimately, the scope is to enable the long-term viability of the two sectors considered, which are also strongly dependent on the safeguarding of the iconic natural characteristics of the Mediterranean marine environment.

Following this introduction, the guidelines are structured into three chapters. Chapter 2 provides a concise description of cruise and recreational boating trends in the Mediterranean, highlighting the growing importance of the two sectors in the region. It also illustrates major on-going and future challenges for the sustainability of the two sectors. A vision for the sustainable, long-term management of cruising and recreational boating is illustrated in Chapter 3 (Section 3.1) and is structured into specific sustainability objectives (Section 3.2) which intend to provide a response to the challenges identified. Section 3.3 constitutes the core of the guidelines and presents an extended catalogue of practices which can be implemented, at different scales and by different actors, to push the sectors towards the sustainability objectives identified. Finally, Chapter 3 includes examples of indicators that can be used to monitor progress towards the sustainability objectives identified (Section 3.4). The guidelines are supplemented by the description of some case studies, i.e. examples of implementation of a practice or a set of practices in a given place (Chapter 4).

These guidelines have been developed by capitalising on available projects, studies and articles, and on the basis of a participatory process by creating a multi-stakeholder group. The literature review phase, in particular, capitalised on the results of modular projects that are part of

three Interreg MED thematic communities (Blue Growth, Sustainable Tourism and Biodiversity Protection) and the results of the BlueBoatsMed start-up project under the BlueMed CSA initiative. The full list of sources used to compile the catalogue of practices for the sustainability of the cruise and recreational boating sectors is reported in the references section.

Stakeholders have been consulted in three phases:

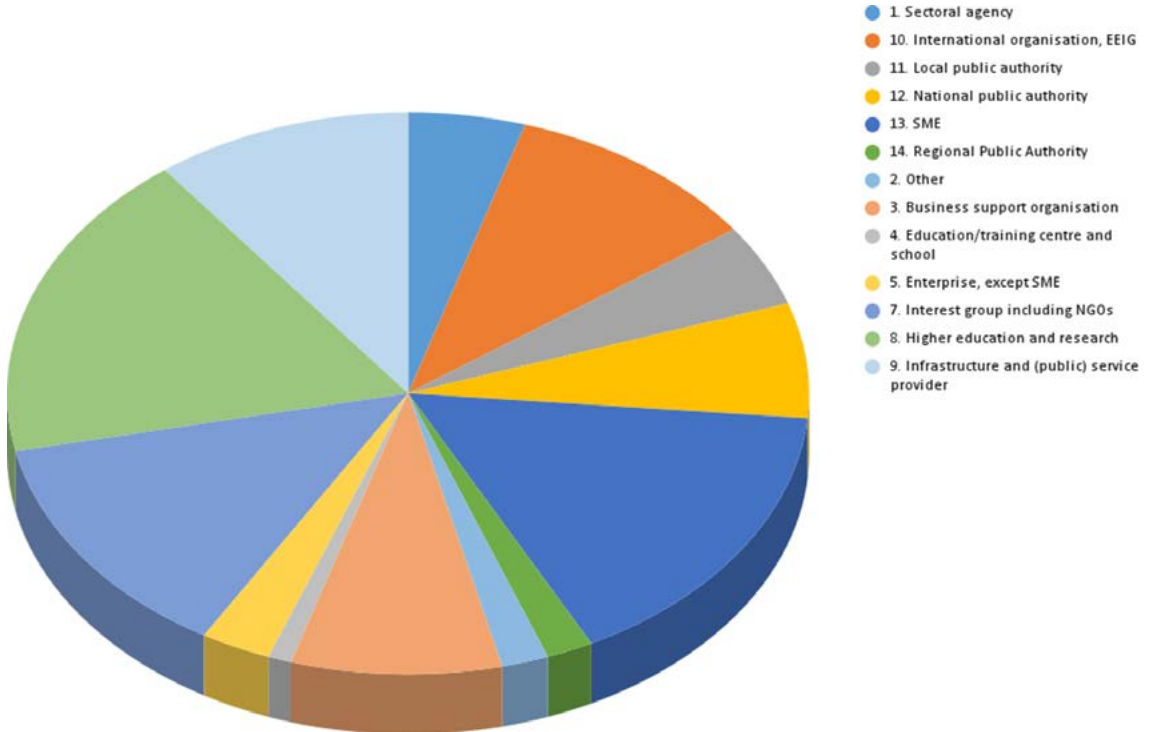
- *A first survey collected stakeholders' comments on the vision for the sustainability of the cruise and recreational boating sectors and related sustainability objectives. Stakeholders were also asked to score each objective in terms of relevance and feasibility for each of the sectors.*
- *A second survey collected stakeholders' views on the catalogue of practices for sustainability. In particular, stakeholders were asked to supplement the catalogue with missing practices and identify the most relevant practices for cruising, ports, recreational boating and marinas.*
- *Finally, three half-day stakeholder workshops were organised to present the draft version of the guidelines, discuss the results of the above surveys, and collect final stakeholder input on the overall document.*

The multi-stakeholder group was composed of representatives of port authorities, local authorities, the cruise business, the boating industry, scientific research institutions and universities, environmental associations, tourism observatories, marine protected area managers, and environmental and tourism consultants (cf. Figure 1). The list is available in Annex.

These guidelines provide focused information on sustainability objectives and practices for cruising and recreational boating, aimed at supporting major actors (national and local administrations, cruise companies, ship industry, port authori-

ties, MPA managers, boat owners, tourists and tourism operators, associations and research institutions) involved in promoting the medium- (2030) and long-term (2050) transition of the two sectors towards sustainability. The guidelines capitalise on a rich and wide set of information sources, in particular developed in the framework of the Blue Growth, Sustainable Tourism and Biodiversity Protection Interreg MED communities of projects. To guide the target users towards essential information, the guidelines do not aim to be comprehensive of all aspects; they link to studies, projects and papers that have been capitalised upon to explore in greater detail.

Figure 1 Different types of stakeholders represented in the working group



02

Trends & challenges



Global ocean cruising is a fast-growing industry and the biggest sector in the tourism economy in terms of gross added value and employment ^[1]. The cruise industry contributed a record €57.3 billion to the European economy in 2019.

In recent years, this activity has become more economically accessible, and the number of passengers has increased considerably both at global and Mediterranean level. The Mediterranean welcomed more than 8 million cruise passengers in 2017, which is double the number of passengers welcomed in 2006. Tracking global trends (annual passenger growth rate of 6.63% from 1990-2020 ^[1]) shows that the number of cruise passengers at Mediterranean ports is increasing. More than 31 million passenger movements were registered in 2019, with an increase of 11.5% compared to 2018.

Since 2011, the total number of cruise passenger movements in Mediterranean ports has never dropped below 25 million ^[2]. Thirty-six Mediterranean ports are said to be “major” as they receive more than 120,000 passengers per year. These figures confirm the Mediterranean as the most popular cruise destination for European travellers and the second market globally for the industry ^[1]. The warmest season is the favourite for Mediterranean cruising, with an increasing number of passengers travelling between May and October (about 70% of total passenger numbers, ^[2], ^[5]).

The Mediterranean Sea is also a popular destination for recreational boating, which is a large and heterogeneous sector including both small vessels (< 24 m) and large vessels (yachts > 24 m and megayachts > 34 m). The large majority of boats, however, are below 8-10 m. The sector is driven by the seascape, bays and islands that feature in the Mediterranean, and also by the high number of facilities for nautical activities, mainly located along the northern coasts of the basin. Mediterranean nautical tourism produces an important share of the EU's economic output generated by the sector ^[4]. Most leisure vessels travelling in the Mediterranean are less than 24 metres long, but there is an increasing number of large yachts, following global trends ^[3].

A large share of the world's megayachts (about 70%) sail in the Mediterranean all year long, with marinas generally close to full capacity, especially in the Western EU-Mediterranean countries during the high season ^[5]. Yacht owners often come from extra-Mediterranean countries, unlike recreational boat owners who are mainly local. The small recreational

Mediterranean as the most popular cruise destination for European travellers and the second market globally for the industry

boating market (boats < 24 m) is stagnating somewhat, with the exception of the segment of large catamarans that continues to grow, and the use of hybrid and electric propulsion systems. The average age of small boat owners is increasing, while younger generations are increasingly looking for renting services, boat co-ownership or integrated offers provided by tourism platforms. Both yachting and small recreational boating can rely on the growing role of the repair and refit industry, and an increasing number of services proposed to boaters in marinas ^[5].

The global COVID-19 crisis, as a highly unpredicted health, economic and social challenge for the sector, started affecting the cruising and recreational boating/yachting sectors in the early months of 2020, in both the Mediterranean basin and worldwide. The pandemic forced most cruising companies to suspend their operations, while others started to implement adaptation strategies through new health and safety protocols and mandatory on-board measures to prevent the risk of infection. In the same way, recreational boating and yachting came to a halt during 2020, following measures to contain the infection that caused complete or partial restrictions for these activities. However, specific market segments in the sector have been able to significantly grow, such as leasing, second-hand, nautical chartering and yachts/superyachts ^[5].

Although the 2020 pandemic marked a strong interruption to the growing trends of cruising and recreational boating, the Mediterranean will most likely resume its role in maritime tourism, allowing new positive trends for the near future. Moreover, we can expect that the pandemic strengthened public awareness on the environmental



compatibility and sustainability of the sector, especially for big cruises. The recent health crisis, together with environmental and social sustainability issues, are shaping the future of the sector, shining a spotlight on the importance of initiatives aimed at improving the safeguarding of safety, health and the environment, and ultimately the well-being of Mediterranean communities.

The environmental and social concerns that both the cruising and recreational boating sectors are facing could be regarded as limiting factors for their development. However, building on the sustainability principles, they also act as opportunities for innovation in the maritime industry, in cruising and nautical operations and in the creation of more diversified and attractive tourism offers.

Based on the commitments and objectives set at the international, European and Mediterranean levels (see Chapter 3), these guidelines consider five major challenges for the sustainability of cruises and recreational boating in the Mediterranean. The following challenges are structured into sustainability objectives, as described in Section 3.2.



CH.1 Eliminating air emission of pollutants & greenhouse gases

Maritime transport, especially cruise ship traffic, is one of the leading sources of air pollution in port and coastal cities.

The main air pollutants that occur as a negative product of fuel combustion during maritime activities are nitrogen oxides (NO_x), sulfur dioxide (SO₂), carbon monoxide (CO), carbon dioxide (CO₂) and particulate matter (PM). In the form of fine particulate matter (PM_{2.5}), they contaminate the environment and become dangerous to the health of living beings. The increasing number of stringent regulations in force at the international level in the framework of Mediterranean and European policies and conventions is forcing the cruise and recreational boating industry to upgrade the environmental performance of ships and boats to meet the new required environmental standards on air emissions. The regulations differ according to the type of boat: while cruise ships and pleasure craft larger than 24 m have to comply with IMO rules, vessels smaller than 24 m have to comply with national or European rules (e.g. The EU Recreational Craft Directive 2013/53). In January 2020, the new limit of sulfur in the fuel oil used on board for ships operating outside designated emission

control areas was set at 0.50% m/m (mass by mass), implying a significant reduction from the previous limit of 3.5%, which has required ship operators and owners to plan ahead to use compliant fuel oils or alternative fuels. In addition, new ambitious objectives on climate change mitigation (i.e. under the EU Green Deal or in the framework of IMO) are imposing that the sectors take into consideration the use of alternative fuels and energy sources, also by improving the energy efficiency of vessels. In December 2021, at COP 22, the Contracting Parties to the Barcelona Convention and the European Union adopted the decision on the designation of the Mediterranean Sea as a whole as an Emission Control Area for Sulfur Oxides (Med SO_x ECA), allowing only 0.1% sulfur in fuel. In 2022, the International Maritime Organization must officially validate this measure, which will reduce from 0.5% to 0.1% the level of sulfur accepted in fuel oil in the Mediterranean Sea.

This measure will be effective on 1 January 2025 and should lead to a 79% reduction in sulfur oxide emissions and a 24% reduction in fine particles. Following global attention on these issues, air quality and climate change are also a top priority for ports and marinas as they have significant health impacts.



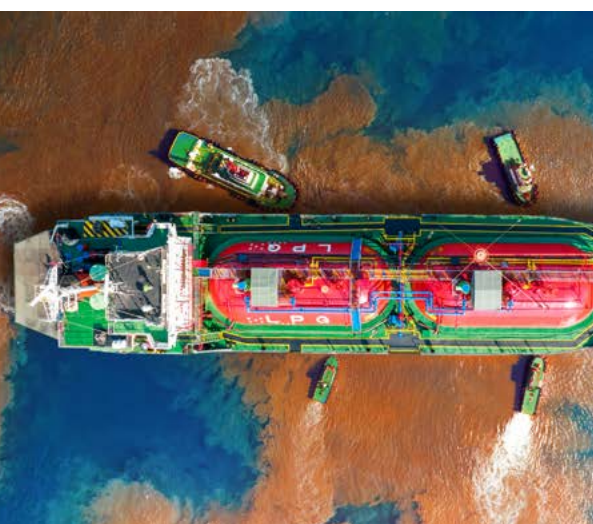
CH.2 Safeguarding ecosystems and biodiversity.

The Mediterranean Sea includes precious and unique natural ecosystems, hosting important habitats and rich biodiversity. Coastal and shallow natural areas are also highly attractive for maritime and coastal tourism activities, including recreational boating and, to some extent, cruising. Recreational boating exerts many pressures on the marine environment including pollution (noise, fuel, black and grey water, anti-fouling paints, etc.), habitat fragmentation (anchoring), among others.

Anchoring is one of the significant pressures that causes major damage to sensitive coastal habitats that are protected under different area-based conservation measures. Similarly, cruise ships anchoring in close proximity to highly sensitive natural areas, including protected ones (MPAs) and Other effective area-based conservation measures (OECMs), can be responsible for impacts on benthic ecosystems.

Risk of collision to marine megafauna and disturbance through underwater noise, light pollution or sediment resuspension are other impacts on Mediterranean species, influenced by the increasing speed, dimension of vessels and total number of ships and boats ^{[1], [3]}.

These impacts are increasingly challenging cruising and recreational boating, especially in consideration of new biodiversity targets adopted at the international and European levels (International Convention on Biological Diversity and EU Biodiversity Strategy).



CH.3 Eliminating inputs of water pollution, preventing waste generation and improving its management

Cruising and recreational boating can cause chemical and biological water contamination, in particular through the release of anti-fouling agents and hydrocarbons (bilge water, ballast water, fuel intake points) and wastewater discharge respectively. Also, due to the high consumption level of passengers on board a cruise ship, large amounts of solid and liquid waste are delivered to ports which need to be increasingly equipped with proper facilities for waste management, otherwise can be accidentally released into the marine environment, causing additional pollution.

End-of-life boats are posing additional challenges for the sector, calling for viable solutions for their management and causing water pollution if they are abandoned in the marine environment. Major concerns relate to hulls built with Fiberglass-Reinforced

Polymer (FRP), whose production started about 50 years ago which are now progressively reaching end of use (SWD(2017) 126 final).

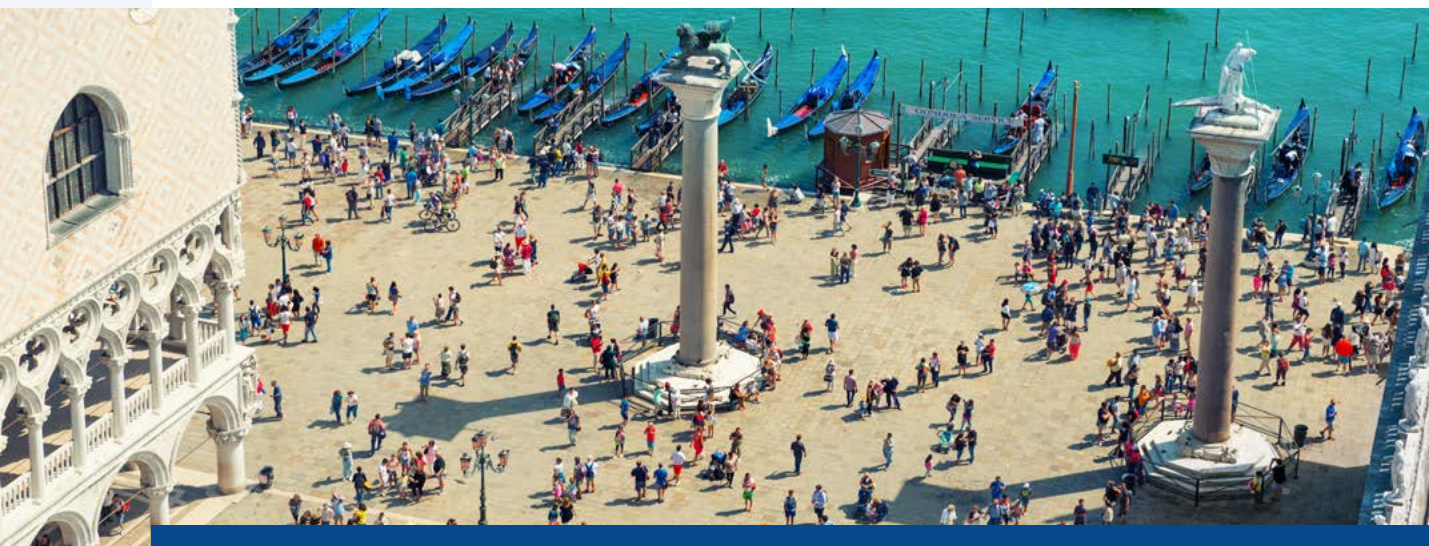
The major challenge for end-of-life composites, which are used in many applications including recreational boats, is their recycling. While pilot solutions exist, these have to be scaled up at an industrial scale. This requires the cooperation of all sectors, also including, for instance, wind energy. Cooperation between these sectors and the composites sector is ongoing at European level.



CH.4 Boosting knowledge and innovation

The lack of proper knowledge about the social and environmental impacts related to cruising and recreational boating and about how to reduce them can prevent the adoption of evidence-based strategies or good practices for the sustainable management and development of the sectors.

The challenge is to promote structural changes in both sectors, through the improvement of governance and the establishment of dialogue between the actors involved (cruise operators, port and marina operators, coastal tourism stakeholders, citizens, etc.), greater access to technological innovation (green technologies and products, digitalisation, science-based instruments), improved capacity building, upgraded knowledge and skills of operators and authorities, improved awareness of tourists and citizens.



CH.5 Avoiding impacts on local socio-economic systems

Coastal communities can surely benefit from cruising and recreational boating activities in terms of economic development and job creation. However, tourism pressure can locally increase to unsustainable levels and lead to the degradation of the living conditions of local populations (e.g. overcrowding, visual degradation of landscape, land-use change, change in the local socio-economic system, damage of cultural heritage, impacts on landscape and seascape, etc.).

The impact of cruises can reach intolerable levels for residents, giving rise to tensions between cruise companies, cruise passengers, local populations and local authorities. The current challenge is to ensure that recreational boating and cruising mainly represent an opportunity for the sustainable development of coastal communities and do not adversely impact local socio-economic systems.

Sustainable management of tourist destinations, the assessment of the carrying capacity of each destination and the equitable distribution of the benefits are essential for the long-term development of cruising and recreational boating.

03

Roadmap to environmental sustainability



3.1 Vision for cruising & recreational boating

All Mediterranean blue economy activities rely on the marine space and the integrity of its environment and resources. This also holds true for cruising and recreational boating, two important and still fast-growing segments of the tourism economy of the region. The challenge is to foster the transition of these two sectors towards environmental and social sustainability, in line with the Sustainable Development Goals (SDGs) of the UN 2030 Agenda, the objectives of the Mediterranean Strategy for Sustainable Development 2016-2025 (MSSD) of the Barcelona Convention, the European Green Deal (COM (2019) 640 final), and more recently, the EU approach for a sustainable blue economy (COM(2021) 240 final) and the Sustainable and Smart Mobility Strategy (COM(2020) 789 final). This vision considers both activities at sea (navigation) and shore-side activities (ports and marinas), recognising the importance of land-sea interactions to achieve sustainability objectives.

There is an urgent need to improve the sustainability of cruising and recreational boating to avoid, or at least minimise, pressures and threats to the Mediterranean

coastal and marine environment, landscape and seascape, preserve liveability in major tourism destinations and improve the well-being of local communities. This will contribute to ensuring the balanced and long-term (2050) development of cruising and recreational boating and the equitable distribution of their social and economic benefits among Mediterranean communities. For cruising and recreational boating, this requires innovative strategies, approaches and actions that aim to contribute to major global and regional environmental challenges. These include the achievement and maintenance of the Good Environmental Status (GES) of the sea, as framed by the Ecosystem Approach (EcAp) of the Barcelona Convention system and the EU Marine Strategy Framework Directive (2008/56/EC).

Cruising and recreational boating should be regulated, organised and managed such that their impacts on the environmental quality, biodiversity, habitat and species of the Mediterranean Sea are avoided, minimised or compensated for. They are called on to contribute to the transition towards decarbonisation, improved air quality and making the most of the opportunities offered by the circular economy concept. In a future sustainable vision, cruising and recreational boating are also expected to generate

more socio-economic benefits than negative impacts for local communities, including inland ones, in particular through the promotion of more sustainable tourism models. The future sustainable vision of cruising and recreational boating strongly relies on restrictions, research and innovation, awareness-raising and education (ocean literacy), sustainable behaviour (by tourists, operators, citizens, decision-makers, etc.), improved dialogue between stakeholders, stronger integrated governance promoting the involvement of local communities and local authorities (also in the framework of the Protocol on Integrated Coastal Zone Management (ICZM) and Marine Spatial Planning (MSP) processes), the sharing of good practices and opportunities among Mediterranean countries and stronger transnational cooperation.

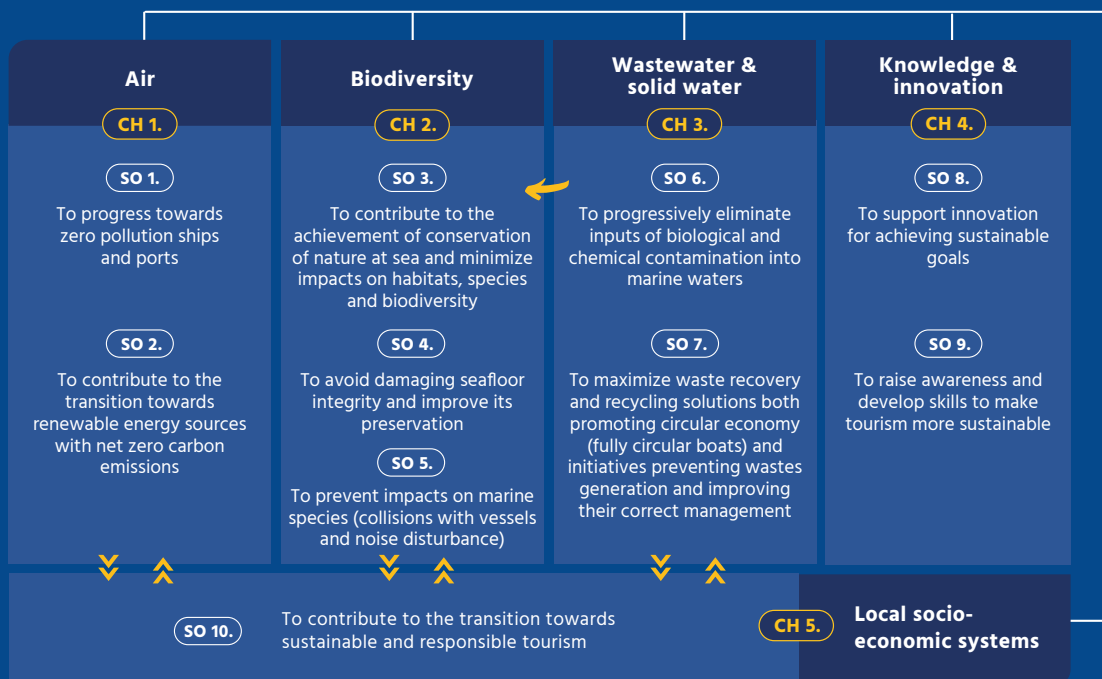
3.3 Sustainability objectives

The vision is structured into ten sustainability objectives, described in the following pages and listed in Table 1. These objectives refer to the key challenges for the cruising and recreational boating sectors, illustrated in Chapter 2. Objectives are strictly interrelated, as shown in the diagram in Figure 2. The objectives are intended to be reached through a progressive approach: as far as possible they should be implemented in the medium term (2030), aiming for full implementation by 2050. To this end, several practices for sustainability that are ready to be disseminated or that can be disseminated by 2030 are included in this report.

Table 1 Objectives for sustainable cruising and recreational boating and related challenges

OBJECTIVE	MAIN CHALLENGE
<p>SO 1. To progress towards zero pollution ships and ports</p> <p>SO 2. To contribute to the transition towards renewable energy sources with zero-net carbon emissions</p>	<p>CH 1. Eliminating air emissions of pollutants and greenhouse gases</p>
<p>SO 3. To contribute to conservation of nature at sea and minimise impacts on habitats, species and biodiversity</p> <p>SO 4. To avoid damaging seafloor integrity and improving its preservation</p> <p>SO 5. To prevent impacts on marine species (collisions with vessels and noise disturbance)</p>	<p>CH 2. Safeguarding ecosystems and biodiversity</p>
<p>SO 6. To eliminate inputs of biological and chemical contamination of marine waters</p> <p>SO 7. To maximise waste recovery and recycling solutions, both promoting the circular economy (fully circular boats) and initiatives preventing waste generation and improving correct waste management</p>	<p>CH 3. Eliminating inputs of water pollution, preventing waste generation and improving its management</p>
<p>SO 8. To support innovation for achieving sustainable development goals.</p> <p>SO 9. To raise awareness and develop skills to make tourism more sustainable</p>	<p>CH 4. Boosting knowledge and innovation</p>
<p>SO 10. To contribute to the transition towards sustainable and responsible tourism</p>	<p>CH 5. Avoiding impacts on local socio-economic systems</p>

Figure 2 Diagram showing the interrelations among different sustainability objectives



SO.1 To progress towards zero pollution ships and ports

A zero pollution ambition for a toxic-free environment” is one of the objectives of the European Green Deal. The new 0.5% limit on sulfur in ship fuel oil, which has been in force since 1 January 2020, according to the IMO’s MARPOL treaty (the International Convention for the Prevention of Pollution from Ships), marked a significant milestone to improve air quality, preserve the

environment and protect human health. The limit applies to all ships of any dimension. An even more ambitious measure was adopted by the Contracting Parties to the Barcelona Convention in December 2021 with the designation of the Mediterranean as a whole as an Emission Control Area for Sulfur Oxides (Med SOx ECA), allowing only 0.1% sulfur in fuel oil.

This measure will become effective on 1 January 2025. For the cruise and recreational boating sectors, this implies the progressive adoption of systems and technologies enabling zero emissions of air pollutants during navigation and in ports and marinas, as well as the reduction of noise emissions when keeping station.

These objectives are expected to generate significant health benefits and improve

the well-being of coastal communities. According to assessments carried out, the Med SO_x ECA will prevent more than 1100 premature deaths each year due to lung cancer, cardiovascular disease and strokes, as well as more than 2300 cases of asthma in children [6]. Solutions include effective regulation and actions based on

the sensitivity of the environment and on the Precautionary Principle, more energy-efficient vessel design, the enhanced use of green fuels (including synthetic fuels, bio-based fuels, hydrogen), electrification, hybridisation and the use of renewable energy in ports and marinas (hubs for sustainable energy production and consumption).



SO.2 To contribute to the transition towards renewable energy sources with net zero carbon emissions

The EU Green Deal and its linked thematic strategies and action plans establish net zero greenhouse gas emissions by 2050. These objectives concern the overall socio-economic system.

According to the recent EC communication "COM(2021) 240 final", a sustainable blue economy is expected to contribute to the decarbonisation process, in particular by developing offshore renewable energy and greening maritime transport, ports and marinas. The roadmap introduced in the EU Smart and Sustainable Mobility Strategy

aims for zero-emission vessels to become ready for market by 2030.

The Green Deal also states that the ecological transition for Europe can only be fully effective if the EU's immediate neighbourhood also takes effective action. Southern Mediterranean countries are thus key partners to achieve common objectives in the sector. This approach should be considered when the EU launches funds for neighbourhood policies. IMO's vision is to reduce total annual GHG emissions from international shipping by at least 50% by 2050 compared to 2008 (MEPC.304(72)).

In 2021, the Glasgow Declaration on Climate Action in Tourism raised the climate ambition of tourism stakeholders and secured strong actions to support the global commitment to halve emissions by 2030 and reach Net Zero as soon as possible before 2050 [7]. Moreover, regulations on energy efficiency for ships included in Annex VI of the MARPOL Treaty are aimed at reducing GHGs and apply to new and existing ships of 400 gross tonnage and above. The complete package of International and European policies calls

for the adoption of solutions similar to those highlighted for SO1, pointing to increasing the energy efficiency of vessels, the transition

towards green fuels and the development of ports and marinas as renewable energy hubs.



SO.3 To contribute to the conservation of nature at sea and minimise impacts on habitats, species and biodiversity

The international Aichi Target 11 of the Convention on Biological Diversity establishes that at least 10% of coastal and marine areas should be conserved through effectively and equitably managed, ecologically representative and well-connected systems of protected areas and other effective area-based conservation measures.

The EU Biodiversity Strategy (2020) establishes targets that are even more ambitious: 30% of the EU seas should be conserved through Marine Protected Areas (MPAs) by 2030, one third of which through strict protection measures.

At the Mediterranean level, the Barcelona Convention system has launched an ambitious process aimed at developing the

post-2020 Strategic Action Programme for the Conservation of Biodiversity and Sustainable Management of Natural Resources in the region (known as Post-2020 SAP BIO).

The sustainable development of blue economic sectors, including cruising and recreational boating, must consider biodiversity conservation objectives and initiatives such as the Post-2020 Mediterranean Marine Protected Areas Roadmap. This implies the implementation (and monitoring) of ecosystem-based approaches, innovative technologies and actions that are respectful of the needs of MPAs and not destructive or harmful to the coastal and marine environment, as well as the development of synergies with conservation objectives (e.g. delimitation of areas to be avoided, identification of buffer areas, development of a sustainable tourism offer that can generate revenue for protected areas, etc.).

This objective is linked to SO4 and SO5 which better detail specific aspects related to this overarching goal, respectively the preservation of seafloor integrity and the minimisation of direct impacts on marine species (i.e. collisions with megafauna and noise disturbance).



SO.4 To avoid damaging seafloor integrity and improve its preservation

In order to achieve Good Environmental Status according to EcAp and MSFD, sea floor integrity must be at a level that ensures that the structure and functions of the ecosystems are safeguarded and benthic ecosystems, in particular, are not adversely affected. This objective is strictly related to SO3 (contributing to the conservation of nature at sea), since maintaining sea-floor integrity is necessary to preserve habitats and their functions, as well as the marine

biodiversity and living resources they host. Particular attention is needed for the preservation of *Posidonia oceanica* meadows, which are among the priority habitat types for conservation under the Habitat Directive, and among the habitats most threatened by anchoring and sediment resuspension in shallow waters. The recreational boating sector is particularly concerned here.

To achieve this objective, initiatives aimed at making information available to boaters on the distribution of sensitive habitats and their ecological value, limiting anchoring and its impact on the seafloor and/or avoiding anchoring in sensitive habitat areas should be promoted for both cruising and recreational boating. In particular, alternative and innovative mooring systems can be deployed in order to reduce the impact of anchoring (permanent mooring systems, GPS anchoring, floating berths, less impactful anchors).



SO.5 To prevent impacts on marine species (collisions with vessels and noise disturbance)

The conservation of cetaceans, by preventing threats and improving current knowledge on these animals, is the central objective of the ACCOBAMS (Agreement on the Conservation of Cetaceans of the Black Sea, Mediterranean Sea and Contiguous Atlantic Area). The conservation of cetaceans and other marine species is also among the objectives of the International Convention on Biological Diversity, the EU Biodiversity Strategy and the EU Marine Strategy.

To contribute to the achievement of international and European conservation objectives, collisions with megafauna from shipping (including cruising and larger vessels used for recreational boating) and any other form of disturbance of all marine species (in particular, through underwater noise generation)

must be avoided or minimised as much as possible. Measures (e.g. reducing ship speeds) should be taken to reduce collisions and the active involvement of cruising and boating stakeholders in monitoring activities and conservation objectives should be encouraged.



SO 6 To progressively eliminate inputs of biological and chemical contamination into marine waters

The European Water Framework Directive (2000/60/EC) aims to achieve the good chemical and ecological status of all surface water bodies, including coastal waters. Similarly, the Marine Strategy Framework Directive (2008/56/EC) aims to achieve the Good Environmental Status (GES) of marine waters. In line with the EU MSFD, the Barcelona Convention system applies the Ecosystem Approach (EcAp), an overarching approach that aims to achieve GES in the entire Mediterranean Sea. GES means that human activities introducing substances into the marine environment do not cause pollution effects and non-indigenous species do not adversely alter the ecosystem.

For cruising and recreational boating (especially bigger yachts), this implies promoting technological innovation and upgrades, as well as management initiatives that aim to progressively eliminate:

- *Microbiological contamination, eutrophication and hypoxia from “black water” or “grey water” systems, coming from toilets, bathing and washing on board;*
- *Chemical contamination from hydrocarbons (bilge water, ballast water, fuel intake points);*
- *Heavy metal pollution from anti-fouling agents (e.g. copper);*
- *Introduction of non-indigenous species, through incorrect management practices of ballast water or through a ship’s hull fouling, especially for vessels that also travel in areas outside the Mediterranean basin.*

Chemical and biological contamination can affect biodiversity, threatening the preservation of ecosystems and habitats and the health of most sensitive species. Recent studies have linked the seasonality of tourism to a 10 to 20-fold increase in copper concentrations because of the use of anti-fouling agents [8].

Ports also suffer a dramatic deterioration in ecological status when nautical tourism increases [9]. Therefore, this objective is

related to SO3 (to contribute to the conservation of nature).



SO.7 **To maximise waste recovery and recycling solutions, both promoting the circular economy (fully circular boats) and initiatives preventing waste generation and improving correct waste management**

The 2020 EU circular economy action plan (COM(2020) 98 final) sets forth an ambitious agenda for keeping materials and resources in the economy as long as possible and for minimising waste, thus increasing circularity. The transition from a “linear economy” towards a more “circular” approach, as part of the European Green Deal’s objectives, is an essential requirement to ensure a sustainable, low-carbon, resource-efficient and competitive economy. In the Mediterranean, the Regional Action Plan on Sustainable Consumption and Production (SCP Action Plan) promotes the shift towards a more sustainable and circular economy, and consumption patterns with lower environmental footprints.

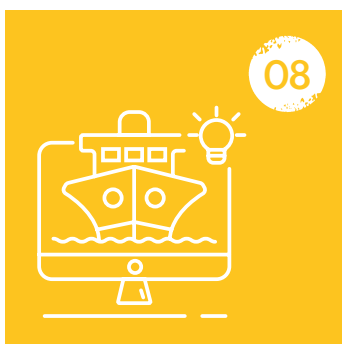
This transition can open new opportunities for business development and job creation in the blue economy sector. The Commission Staff Working Document on Nautical tourism (SWD(2017) 126 final) highlights the importance of a circular boating economy, encouraging solutions for boat recycling, research in new materials and the adoption of Extended Producer Responsibility (EPR) schemes to produce fully circular boats. This can reduce the risk of the abandonment of “end-of-use” or “end-of-life” boats and the consequent release of liquid (spills or leakages) and solid waste into the marine environment. Life cycle analysis of tourism vessels should be considered from the beginning of life (shipbuilding) to scrapping. There is evidence that ship dismantling outside the EU is very deficient.

The problem of marine litter (any persistent, manufactured or processed solid material discarded, disposed of or abandoned in the marine and coastal environment) relies on the current consumption patterns and partly originates from nautical tourism activities. Marine litter prevention and reduction to a minimum is the first objective of the Regional Plan on Marine Litter Management in the Mediterranean under the Barcelona Convention, which sets specific measures and operational targets to achieve Good Environmental Status in the Mediterranean Sea (in line with EcAp and MSFD). The European target is to halve plastic litter at

sea by 2030 according to the European Commission's new approach for a sustainable blue economy (COM(2021) 240 final).

The Mediterranean is a special area under Annex V of the MARPOL treaty, requiring the adoption of special mandatory methods

for the prevention of marine pollution by garbage. Annex V applies to all ships of any type and prohibits the discharge of garbage onto the sea; the possibility to comply with this largely depends on adequate port reception facilities for the efficient reception of garbage by ships.



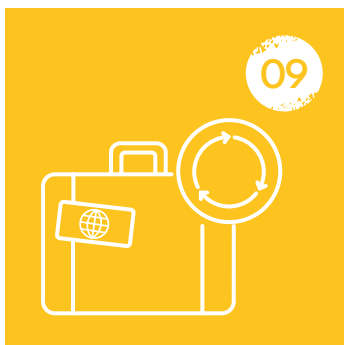
SO.8 To support innovation for achieving the sustainability objectives

Using the best available knowledge is a key principle to address several challenges of sustainable tourism, as noted by the Agenda for a sustainable and competitive European tourism (COM/2007/0621 final). Boosting innovation for cruising and recreational boating, for example by promoting Information Communication Technology and tourism business portals (COM (2014)) 86 final), can help to develop cost-effective measures while also improving the sustainability of the sectors.

Digitalisation of the maritime transport sector is becoming an indispensable driver for its modernisation, as stated in the

European Smart and Sustainable Strategy (COM(2020) 789 final) that encourages the dual green and digital transitions. Technological innovation does not represent a primary end goal but rather a way of achieving other sustainability objectives for the two considered sectors. It includes technologies for improved operations and management of ports and marinas, smart boats, navigation support tools and other digital systems that can enhance the experience of boaters or the economic performance of the sectors while targeting sustainability.

The main goal is to continue research and innovation through dedicated economic funds, also provided by private sources, and to further strengthen partnerships between the sectors and the scientific community. Due to its cross-cutting nature, this objective is related to all the others, as it can contribute to their achievement.



SO.9 To raise awareness and develop skills to make tourism more sustainable

According to the “Agenda for a sustainable and competitive European tourism” (COM(2007) 621 final), initiatives are necessary in order to develop and strengthen tourists’ critical capacity to make choices in favour of environmental and social sustainability. Mainstreaming sustainable consumption and production in the tourism sector is also a pivotal objective of the SCP Action Plan for the Mediterranean.

Considering the growing pressure from tourism, sustainable and responsible forms of tourism can be fostered by initiatives that promote the spreading of ocean literacy, awareness-raising for tourists and tourism

operators regarding the environmental impacts of cruising and recreational boating, both during navigation and in ports and marinas, as well as by training and skill development initiatives targeting specific users (e.g. boaters, tourism operators, cruise crews, port personnel and guests).

Coordinated dialogue between different blue economy operators (Blue Forum for users of the sea) is encouraged by the Communication of the European Commission on the Blue Economy, while knowledge-sharing initiatives about best practices involving all stakeholders are recommended by the European Strategy for more Growth and Jobs in Coastal and Maritime Tourism (COM(2014) 86 final). Strategically planned knowledge-sharing initiatives can also be promoted as part of integrated management and planning processes, such as ICZM and MSP. The growing understanding of sustainability among consumers might conversely influence businesses, further unlocking the potential of the sustainable tourism offer. This objective represents a way of achieving sustainability for several other aspects; therefore it is strictly related to all the other objectives.



SO.10 To contribute to the transition towards sustainable and responsible tourism

Principles for achieving a competitive and sustainable tourism are set out in the Agenda for a sustainable and competitive European tourism (COM (2007) 621 final).

They include the use of a holistic and integrated approach that takes into account all the various impacts of tourism, as well as the proper assessment of the carrying capacity of each destination site. This implies ensuring readiness and the ability to limit, where and when appropriate, the amount of tourism development and volume of tourist flows, while also ensuring the preservation of landscapes and seascapes. objective of the ACCOBAMS (Agreement on the Conservation of Cetaceans of the Black Sea, Mediterranean Sea and Contiguous Atlantic Area). The conservation of cetaceans and other marine species is also among the objectives of the International Convention on Biological Diversity, the EU Biodiversity Strategy and the EU Marine Strategy.

Diversifying existing portfolios of tourism offers with new products and high-quality services based on sustainability concepts can support the transition towards responsible tourism, with benefits for the environment and socio-economic returns and well-being for local communities. The promotion of ecotourism, sustainable

management of tourism destinations and tourism diversification are key objectives for the sector under the SCP Action Plan for the Mediterranean, along with pivotal actions under the “European Strategy for more Growth and Jobs in Coastal and Maritime Tourism” (COM (2014) 86 final). For cruising, this means, for example, supporting low season offers that can stimulate economic growth and jobs across the Mediterranean, contributing to decreasing the concentration of mass tourism in a single season.

However, this should be managed properly to avoid it causing high pressure on the coastal and marine environment for a longer period. Recreational boating has a high, often unlocked, potential to develop synergies with more sustainable forms of tourism, also during the low season, including experience-based tourism, slow tourism and eco-tourism. These can offer products for responsible tourists, ranging from serving local products to environmentally-friendly business models and practices (COM (2014) 86 final).

3.2.1 Relevance & feasibility of sustainability objectives

Members of the stakeholders’ group set up to develop these guidelines were asked to score the sustainability objectives described in the previous section according to their relevance for sustainability and their feasibility. Separate relevance and feasibility scores (Table 1) were assigned by stakehol

ders for cruising and recreational boating, considering the distinctive features of each sector. These are semi-quantitative, expert-based scores, which therefore provide an indicative understanding of which objectives are perceived as more relevant to pursue for each sector, and which are considered as more easily achievable in the medium term (2030). Results are shown in Figure 3 for cruising and Figure 4 for recreational boating.

The most relevant objectives for cruising are SO1 (zero pollution ships and ports), with an average score of 2.8, and SO2 (to contribute to the transition towards renewable energy sources with net zero carbon emissions), with an average score of 2.7. The least relevant objective for cruising is SO4 (to avoid damaging seafloor integrity), with an average score of 2.1. Nevertheless, almost half of respondents consider this objective as highly relevant (score of 3), revealing quite different visions among stakeholders. All the other sustainability objectives have quite similar average scores (in the range of 2.3 - 2.6).

Concerning the feasibility of sustainability objectives for cruising, SO6 (to progressively eliminate inputs of biological and chemical contamination into marine waters) appears the most promising (average score of 2.6). Interestingly, the lowest feasibility score (1.6) is assigned to SO2 (to contribute to the transition towards net zero carbon emissions) although it is perceived as one of the most relevant for the sector. The same low average score (1.6) relates to SO10 (to contribute to the transition towards sustainable and responsible tourism), also in this case, despite its high perceived relevance.

A quite different picture emerges for the stakeholders' vision of recreational boating. The most relevant objectives are related to the conservation of nature (SO3 - To contribute to the conservation of nature at sea and minimise impacts on habitats, species and biodiversity) and, unlike cruising, the preservation of seafloor integrity (SO4), both with an average score of 2.6 and more than a half of respondents assigning the maximum score to these objectives. The least relevant objectives are SO5 (to prevent impacts on marine species) and SO1 - SO2, both related to air emissions and highly relevant for cruising instead.

Feasibility is quite similar for all sustainability objectives for recreational boating (range 2.1 - 2.6), with most answers assigning the score 2 (objective somewhat feasible). The preservation of seafloor integrity (SO4; the most relevant objective for this sector) is also considered highly feasible (average score of 2.5), suggesting a high potential to achieve progress in this issue. Indeed, the maximum average score for feasibility is related to SO7 (related to the circular economy and waste prevention and management) with 10 out of 18 respondents assigning the maximum score for this objective.

Table 2 *Meaning of the scores for relevance and feasibility*

SCORE	RELEVANCE	FEASIBILITY
0	Not relevant	Unfeasible by 2030
1	Low relevance	Hardly unfeasible by 2030
2	Medium relevance	Somehow feasible by 2030
3	High relevance	Completely feasible by 2030

Figure 3

Cruising: average score for each sustainability objective according to relevance and feasibility.

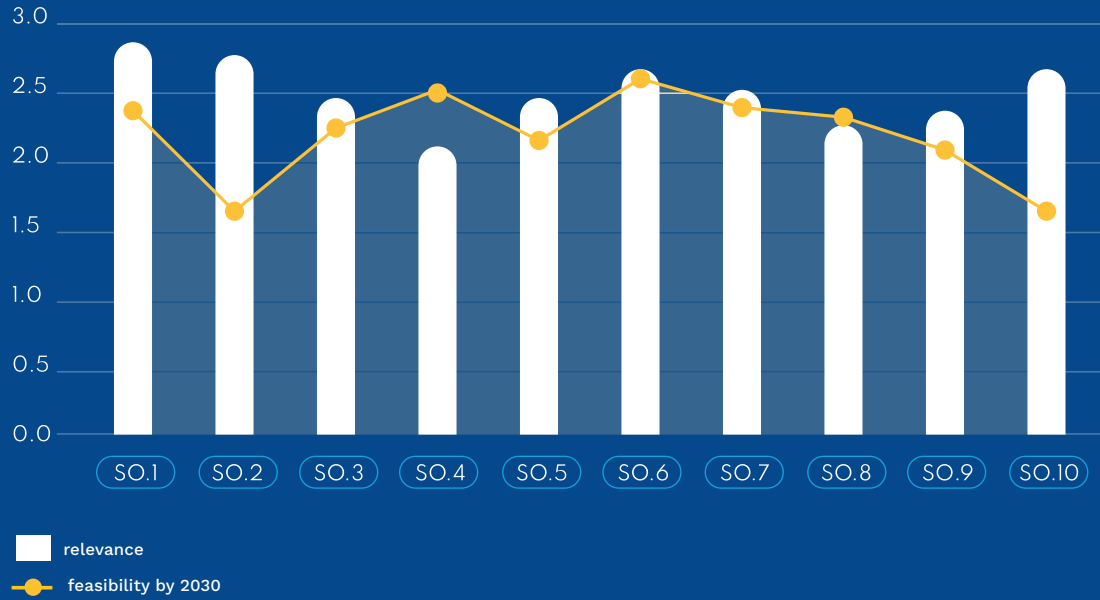
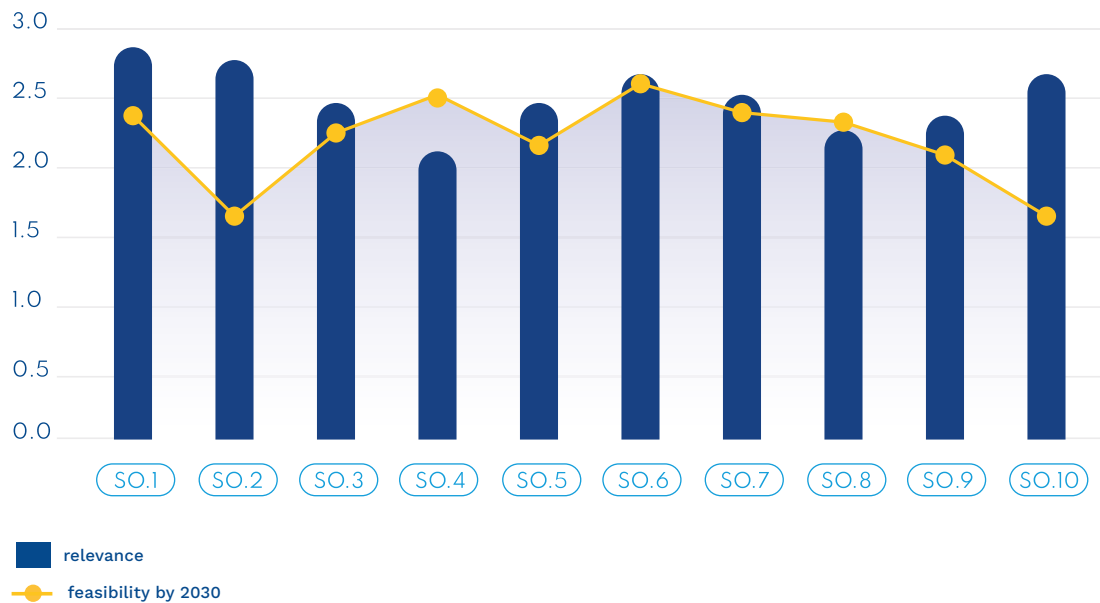


Figure 4

Recreational boating: average score for each sustainability objective according to relevance and feasibility.



3.3 Practices for sustainability

The sustainability of cruising and recreational boating can be pursued through several practices, most of which are already available and implemented across the Mediterranean Sea. In these guidelines, practices for sustainability are defined as measures that can be and should be undertaken by different stakeholders (e.g. tourism operators, port authorities, boat owners, cruise companies, public authorities, etc.) at different levels (e.g. single vessel, company, port or marina, local or sub-national scale, etc.) to help the sector to progress towards the ten sustainability objectives (Section 3.2), in response to the five major environmental and socio-economic challenges identified in Section 2. In these guidelines, practices for sustainability refer to options that can embrace a wide range of specific technological solutions and heterogeneous possibilities for implementation.

All the selected practices have the potential to reduce, to different degrees, the environmental and social impacts associated with cruising and/or recreational boating, with positive implications for society, the economy and governance. Nevertheless, several barriers can hinder the real implementation of these practices, such that the selection of the most effective solutions to be implemented in a given location should be assessed, taking into consideration all local factors, including the site-specific environmental and social conditions, the administrative and legislative frameworks, the economic resources and the infrastructure already in place.

A first selection of 42 practices was shared with stakeholders through a dedicated

survey. Stakeholders were asked to identify the 8 good practices that should be considered as priorities, separately considering cruising, recreational boating, and ports and marinas. Stakeholders were also asked to provide suggestions for additional practices considered relevant to achieve the sustainability objectives and were consulted on practices during the two workshops organised.

For the cruising sector, practices related to the gradual replacement of fossil fuels with new alternative fuels emerged as the most relevant solutions, targeting one of the biggest challenges of the sector (eliminating air emission of pollutants and greenhouse gases). The use of LNG (Liquefied Natural Gas) as an alternative fuel has been noted as a transitional practice, as it has a low sulfur content (compliant with IMO regulations), but still generates emissions that are not fully in line with the decarbonisation goal. New fuels (e.g. biofuel or synthetic fuels including hydrogen with no carbon emissions) and hybrid solutions (wind propulsion, electric propulsion for short voyages or manoeuvring in port areas) are opening new ways for the sustainability of the sector. Legislative regulations addressing all sizes of boats at the EU level and international level, as well as technological innovations, are key factors needed to effectively implement these practices. Energy-saving solutions (more efficient engines or optimised ship design) and the use of renewable energy sources

For the cruising sector, practices related to the gradual replacement of fossil fuels with new alternative fuels emerged as the most relevant solutions, targeting one of the biggest challenges of the sector

are complementary solutions for the decarbonisation of the sector, and ranked in the top positions on the survey. Spatial measures (no-go zones, buffer zones around MPAs and restricted access to sensitive areas) and speed restrictions inside protected areas are equally important measures to address the challenge of safeguarding ecosystems and biodiversity. It also appears relevant to raise awareness with potential consumers/users of cruise ships by providing information about the GHG emissions and physical impacts of this sector on both natural and urban areas.

Similarly, for recreational boating, no-go areas and no-anchoring areas are highly relevant, as solutions with a high potential to target the challenge of safeguarding ecosystem biodiversity. Other important practices relate to the need for increased knowledge and awareness of boaters, especially when they are approaching a sensitive and protected area. Mandatory training in boat permit courses and a safety and environmental briefing for small boat rentals are considered highly important to improve knowledge and awareness about biodiversity protection and the environmental impacts caused by inexperienced manoeuvres. The use of smart applications to encourage respectful behaviour in MPAs and sensitive habitats and to avoid exceeding the tourism carrying capacity of each site are equally relevant. Indeed, electrification of boats (with related charging infrastructure) was the most voted-for practice, followed by energy-saving solutions (fuel-efficient engines) and the use of renewable sources (solar panels). However, despite promising aspects, there are still a variety of technological and commercial barriers to be overcome to support the widescale use of electrification in recreational vessels (e.g. ensuring an efficient power-to-weight ratio)^[20].

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for recreational boating, no-go areas and no-anchoring areas are highly relevant, as solutions with a high potential to target the challenge of safeguarding ecosystem biodiversity

Consequently, both for ports and marinas, the development of infrastructure for shore power connections and for the use of renewable sources emerged as one of the most needed solutions. Another relevant issue for ports and marinas concerns solid and liquid waste management, in this case, stressing the special need for control and monitoring systems. In addition, the certification of ports and marinas (e.g. EMAS, PERS, Ports Propres) was considered among the priority practices, especially if these systems include a mechanism to control the real implementation of the environmental management measures. Differentiated tariffs for port access (favouring more virtuous ships, also with awards schemes) have the potential to encourage the sector to implement solutions that meet environmental standards that are more severe than those imposed by legislation. Finally, local sustainable tourism offers and/or smart mobility solutions to favour low-impact tourism types and to support local economies are also considered as priority practices by stakeholders, both applicable to ports and marinas.

To help stakeholders in the boating and cruising sectors prioritize actions to be implemented, a selection of high-impact practices has been made for each sustainability challenge and by sector (cruising, boating, ports and marinas) based on their high potential for dissemination and significant reduction of environmental impacts.

3.3.1 PRACTICES FOR CH1.

Eliminating air emission of pollutants and greenhouse gases

Practices that address this challenge (Table 2) include the transition to greener fuels and systems to cut emissions, the use of more energy-efficient engines and ship design. The use of renewable and low-carbon fuels must proceed alongside the creation of a proper network of charging and refuelling infrastructure. The establishment of stringent and common regulatory requirements (both for cruise ships and for yachts and smaller boats) that impose limits on air emissions, common standards and binding targets

for infrastructure development can be the initial driver for the implementation of these practices.

Technical innovation is then a key leverage factor, as well as the availability of adequate economic resources (dedicated funding), mainly if the practice requires major infrastructure renovation. The consequent reduction of noxious gas emissions, mainly in ports and marinas, helps improve human well-being and the health of coastal communities (positive social implication for these practices) and can have a financial return if they are properly made known to users (improved marketing image and increased attractiveness of destinations for environmentally-sensitive tourists).

Table 3 Sustainable practices for CH1 -
Eliminating air emission of pollutants and greenhouse gases.

SUSTAINABLE PRACTICE	CRUISING	RECREATIONAL BOATING	PORTS	MARINAS
Air quality monitoring in ports is improved, extended and made publicly available. Introduce air quality monitoring in marinas.			✓	✓
Use Liquefied Natural Gas - LNG (as a transitional fuel) and equip ports with the related infrastructure	✓		✓	
Use new alternative fuels (including biofuels and hydrogen), prepare for future fuel flexibility and equip ports with the related infrastructure	✓	✓	✓	✓
Electrification of ships, ports and marinas (including cold ironing for ships stationary in ports)		✓	✓	✓
Use closed-loop gas scrubbers to reduce air emissions. Filtered residue is treated as hazardous waste and managed in accordance to related EU standards	✓			
Promote tax or incentive systems that favour electricity systems instead of fossil fuels			✓	✓
Use fuel-efficient engines (including four-stroke engines), optimised design of hulls and systems that minimise hydrodynamic resistance	✓	✓		
Use hybrid wind propulsion systems (e.g. wingsails) to limit fuel consumption	✓			
Use solar panels and/or integrate photovoltaic systems into the ports and vessel's electricity grid	✓	✓	✓	✓
Switch to a less polluting fuel or to an electric system when ships are entering ports	✓		✓	
Set up a smart grid for ports to anticipate and optimise electricity consumption and, for example, to favour the use of locally-produced electricity			✓	✓

HIGH-IMPACT ACTIONS:

In order to progress towards zero pollution ships and ports (SO1) and to contribute to the transition towards renewable energy sources with net zero carbon emissions (SO2), the following practices are considered as priorities to be implemented, based on their high potential for dissemination and significant reduction of environmental impacts:

- › **Electrification of ships, ports and marinas**
(including cold ironing for ships stationary in ports)



- › **Promote tax or incentive systems that favour electricity systems instead of fossil fuels**



- › **Use of fuel-efficient engines**
(including four-stroke engines), **optimised design of hulls and systems that minimise hydrodynamic resistance**



- › **Use solar panels and/or integrate photovoltaic systems into the ports and vessel's electricity grid, targeting the whole sector.**



3.3.2 PRACTICES FOR CH2.

Safeguarding ecosystems and biodiversity

Practices that can help in responding to this challenge (Table 3) are numerous and quite heterogeneous by nature and means of implementation. They mainly include spatial measures (no-go zones, no-anchoring zones, eco-mooring areas), regulatory measures (e.g. speed restrictions, strict regulation of nautical activities in marine protected areas) and monitoring activities that can involve stakeholders such as cruise

companies or the yachting sector in scientific research. MSP that provides a zoning of current and future human activities, as well as the most valuable marine ecosystems and habitats (including protected ones), can foster the implementation of spatial measures that respond to this challenge, minimising environmental impacts and social conflicts. Technical innovation can help implement innovative solutions to specific issues (e.g. eco-mooring systems, GPS anchoring, floating berths) while training and educational initiatives are key to increasing the acceptance of restrictive measures by users. The sanctioning of non-respectful behaviour or fee systems to access sensi-

tive areas can generate positive economic impacts, providing additional finance that can be used for other activities that aim to improve environmental protection. An

increased social awareness about the importance of safeguarding ecosystems and biodiversity is one of the main social added values of these practices.

Table 4 Sustainable practices for CH2 -
Safeguarding ecosystems and biodiversity.

SUSTAINABLE PRACTICE	CRUISING	RECREATIONAL BOATING	PORTS	MARINAS
Establish "no-go areas", buffer zones around MPAs or specific authorisation procedures to access extremely sensitive areas.	✓	✓	✓	
Establish no-anchoring areas to protect sensitive species and habitats (including sanctions for non-compliant anchoring), regulate anchoring types and promote the use of ecological moorings	✓	✓	✓	✓
Limit marinas inside and next to MPAs				✓
Establish speed restrictions for ships (including sanctioning systems)	✓	✓		
Full implementation of technological monitoring (Automatic Identification System, satellite data, etc.)	✓			
Establish routing instructions and training for captain and crew to minimise collisions with megafauna	✓	✓		
Engagement of cruise companies and boaters in environmental monitoring initiatives and scientific research	✓	✓		
Monitor vessel position with respect to nearby cetaceans	✓	✓		
New designs and technical solutions (propellers, hull form, on-board machinery) to reduce the underwater noise generated by ships.	✓	✓	✓	✓
Operational measures to reduce underwater noise (regular hull and propeller maintenance, real-time control of noise radiation)	✓	✓		
(Seasonal) re-routing to avoid collision with and disturbance of cetaceans in critical habitats	✓	✓		
Establish speed limits and promote rowing/sailing in MPAs or other sensitive habitats		✓		
Avoid unregulated nautical tourism (and high-impact sports) in MPAs		✓		
Establish or improve the biomonitoring of maritime impacts	✓	✓		
Establish numerus clausus or monthly slots according to the carrying capacity of cities and territories	✓		✓	✓

HIGH-IMPACT ACTIONS:

In order to contribute to the safeguarding of marine and coastal ecosystems and biodiversity, the following practices are considered as priorities to be implemented, based on their high potential for dissemination and significant reduction of environmental impacts:

- › **Establish speed restrictions for ships** (including sanctioning systems)



- › **Establish no-anchoring areas to protect sensitive species and habitats** (including sanctions for non-compliant anchoring), **regulate anchoring types and promote the use of ecological moorings**



In the specific case of Marine Protected Areas:

- › **Establish “no-go areas”, buffer zones around MPAs or specific authorisation procedures to access extremely sensitive areas**



- › **Avoiding unregulated nautical tourism (and high-impact sports)**



- › **Limit marinas inside and next to MPAs**



- › **Establish speed limits and promote rowing/sailing in MPAs or other sensitive habitats**



3.3.3 PRACTICES FOR CH3.

Eliminating inputs of water pollution, preventing waste generation and improving its management

For this challenge, the practices (Table 4) refer to the management options for solid and liquid waste generated by cruising and recreational boating, along with practices that favour the circular economy. They include technological applications for on-board water treatment, and the use of eco-friendly cleaning and anti-fouling products. Practices also refer to the management of end-of-life (or end-of-use)

boats (refit to extend boats' life or recycling solutions) and possible fiscal measures that incentivise reduced waste production both for ships and for ports and marinas. As for the practices targeting the challenge of eliminating air emissions, the establishment of stringent regulatory requirements can drive the innovation process. Technical innovation is essential to develop these practices, as well as the availability of adequate economic resources, especially

in the case of high-tech solutions. Increased social awareness around sustainability issues is the main positive social implication for the implementation of these practices. Coastal and maritime tourism strictly depend on and benefit from good water quality.



Practices that limit water pollution can help increase the attractiveness of tourism offers and destinations, in particular if they are properly advertised to tourists.



Table 5 Sustainable practices for CH3 -
Eliminating inputs of water pollution, preventing waste generation and improving its management.



SUSTAINABLE PRACTICE	CRUISING	RECREATIONAL BOATING	PORTS	MARINAS
Increase monitoring and reporting of ballast water treatment systems and effectiveness	✓			
Dedicated areas for hull cleaning in marinas and ports (with related wastewater management) or closed-loop system for on-shore treatment of cleaning products and products used for vessel maintenance			✓	✓
Environmentally-friendly cleaning products, including information on cleaning performance, toxicity and biodegradability	✓	✓		✓
Eco-friendly anti-fouling paints (copper free or with low copper concentration, ultrasonic systems), water-based ablative paints and other technologies (including hull self-polishing systems) that reduce the release of pollutants into the sea.	✓	✓	✓	✓
On-board closed systems for sewage and bilge water collection and treatment	✓	✓		
Collection of wastewater (also by means of mobile pumps) and analysis and monitoring of port waters			✓	✓
Control and monitoring of wastewater and solid waste management in ports and marinas			✓	✓
Systematic checks on the status of boats in marinas to prevent the release of toxic substances, especially from abandoned or rarely used boats		✓		✓
Provide marinas and ports with facilities and equipment for the management of oily residues			✓	✓
Fiscal measures for those who generate more waste (Producer Responsibility Obligations) whose proceeds will be reinvested in sustainability measures (e.g. creation of funds for the protection of MPAs, support local authorities' efforts towards sustainability, etc.)	✓	✓		
Ready-to-use and cheap dismantling and recycling solutions for end-of-life boats		✓		
Incentives to refit existing boats, rather than dismantle them		✓		
Provide marinas and ports with facilities for recycling waste materials sorted on board			✓	✓
Reduce single-use plastic on board and in ports and marinas	✓	✓	✓	✓
Implement Extended Producer Responsibility in the boating and cruising sectors. Monitor and improve ship dismantling practices	✓	✓	✓	

HIGH-IMPACT ACTIONS:



In order to progressively eliminate inputs of biological and chemical contamination of marine water (SO6), the following practices are considered as priorities to be implemented, based on their high potential for dissemination and significant reduction of environmental impacts:


 
> **Collection of wastewater**
(also by means of mobile pumps)
**and analysis and monitoring of
port waters**



 
> **Control and monitoring
of wastewater and solid
waste management in
ports and marinas**

 
> **Provide marinas and
ports with facilities
and equipment for the
management of oily
residues**

To maximise waste recovery and recycling solutions, both promoting the circular economy (fully circular boats) and initiatives preventing waste generation and improving correct waste management, the five following recommended practices have been selected:

 
> **Fiscal measures for those
who generate more waste**
(Producer Responsibility Obligations)
**whose proceeds will be
reinvested in sustainability
measures (e.g. creation of funds
for the protection of MPAs,
support local authorities' efforts
towards sustainability, etc.)**


> **Incentives to refit existing
boats, rather than
dismantle them**

 
> **Provide marinas and
ports with facilities for recycling
waste materials sorted on board**

 
 
> **Reduce single-use
plastic on board and
in ports and marinas**

3.3.4 PRACTICES FOR CH4.

Boosting knowledge and innovation

Practices that respond to this challenge (Table 5) include actions that promote technical innovation and the increase of knowledge of sector operators and tourists. Examples include the increased digitalisation of the sector, the development of mobile apps, smart marinas and smart boats. Environmental certification systems for ports and marinas, as well the use of financial measures, which act as an incentive to develop sustainable activities, are also included in this group of practices, since these systems generally imply an upgrade in operators' skills and social awareness. Technical innovation is key for all the

practices that imply advanced technological systems, while training activities are cross-cutting factors that can improve the adoption of innovative systems. A clear social benefit is the increase in knowledge, skills and awareness of both sector operators and users. The creation of new and qualified jobs is an envisaged positive effect of the implementation of such practices, as well as the improvement in the attractiveness of tourist destinations and offers.

Practices that contribute to the upgrade in technology, skills and social awareness also contribute to other challenges, allowing initiatives that help safeguard ecosystems and biodiversity, and eliminate air and water emissions.

Table 6 Sustainable practices for CH4 - Boosting knowledge and innovation.

SUSTAINABLE PRACTICE	CRUISING	RECREATIONAL BOATING	PORTS	MARINAS
Promote the best available technology for monitoring key environmental parameters (air quality, water quality – metals, coliform, BOD, etc.) and cooperation with experts and the scientific community.			✓	✓
Smart marinas (digitalisation and interoperability of procedures and services offered by marinas)				✓
Promote the “smart boats” concept : environmentally-friendly recreational boats with technological applications (e.g. monitoring of engine performance, monitoring of fuel consumption and fuel levels, automatic control of air conditioning, etc.)		✓		
Provide boaters with smart applications (navigation tools, spatial information on protected marine ecosystems, most congested areas) to encourage respectful behaviour in MPAs and sensitive areas and to avoid exceeding the carrying capacity of each site		✓		
Allow access in ports, marinas and MPAs to boaters, charters and touring companies that provide sustainability certification for their boats and services			✓	✓
Tariff reduction for port use for vessels that meet severe environmental quality standards or penalties for those that do not respect minimum standards (differentiated port fees)			✓	✓
Sustainability certifications for marinas and ports with proper control and monitoring systems, as well as a third party audit.			✓	✓
Reward/rating systems to facilitate the identification of greener/more sustainable vessels (ranking ships based on environmental performance)	✓	✓	✓	✓



SUSTAINABLE PRACTICE	CRUISING	RECREATIONAL BOATING	PORTS	MARINAS
Use citizen science and involvement for monitoring <i>Posidonia oceanica</i> and other sensitive marine habitats/species and increase awareness on the impacts of anchoring.		✓		
Include mandatory training on environmental awareness in boat permit courses, and a safety and environmental briefing for small boat rentals		✓		
Dedicated training for cruise guests and crew members to increase awareness on board and in ports	✓		✓	
Cruise companies contributing to green funds for the implementation of projects that aim to improve the sustainability of the sector and the coastal territories and communities	✓			
Clear information for guests about sustainable actions implemented by the selected cruise company, before purchasing tickets	✓			
Clear pre-arrival information (also through mobile apps) available for ships and boats approaching ports and marinas about waste collection facilities and systems			✓	✓
Equip marinas with information and material about the environmental value of the area, the presence and distribution of protected species and sustainable behaviour				✓
Permanent technical committee/observatory allowing the exchange of good practices towards sustainability	✓	✓	✓	✓
Charter of commitments/agreements to improve the environmental and social sustainability of navigation and port operations	✓		✓	
Establish financial incentives and support schemes to stimulate innovation and the integration of solutions for designing and manufacturing boats with lower lifecycle emissions and to promote a sectoral shift towards a more circular model		✓		

HIGH-IMPACT ACTIONS:



In order to boost innovation and raise awareness on sustainable tourism, the following practices are considered as priorities to be implemented, based on their high potential for dissemination and significant reduction of environmental impacts:

➤ **Providing boaters with smart applications** (navigation tools, spatial information on protected marine ecosystems, most congested areas) **to encourage respectful behaviours in MPAs and sensitive areas and to avoid exceeding carrying capacity of each site**

➤ **Including mandatory training on environmental awareness in boat permit courses, a safety and environmental briefing for small boat rentals**

- › **Clear pre-arrival information**
(also through mobile apps)
available for ships and boats
approaching ports and marinas
about waste collection facilities
and systems

- › **Tariff reduction for port use**
for vessels that meet severe
environmental quality
standards or penalties for those
that do not respect minimum
standards *(differentiated port fees)*

- › **Permanent technical**
committee/observatory
allowing the exchange
of good practices towards
sustainability

3.3.5 PRACTICES FOR CH5.

Avoiding impacts on local socio-economic systems

Practices for this challenge (Table 6) include actions that minimise the impact of mass tourism on local communities, while also encouraging the active involvement of the local on-shore authorities in initiatives that in accordance with a general sustainable approach to tourism. Public support can be fundamental to boost practices that are respectful of the local economy and society. Increased dialogue between the different stakeholders and local authorities is one of the main positive outputs in terms of governance for this kind of practice.

These practices can have highly positive social implications (human well-being and improved quality of life) due to an improved integration of tourism into the local context. Economic benefits include the possibility of job creation and a general increased attractiveness of destinations and tourist offers. Their effective implementation requires a good prior knowledge of the socio-economic impacts of nautical tourism and the tourist carrying capacity of the destination site as well as the level of social acceptability.

Table 7 Sustainable practices for CH5 -
Avoiding impacts on local socio-economic systems.

SUSTAINABLE PRACTICE	CRUISING	RECREATIONAL BOATING	PORTS	MARINAS
Local mobility solutions in cruise destination cities and major marinas (Low Emission Zones due to low-carbon transport solutions, buses transporting passengers from the port to the centre, bike-sharing systems, specific walking routes for cruise passengers)			✓	✓
Local sustainable tourism offers (sustainable trips, eco-tourism, pesca-tourism, consumption of local food, visit to local museums and cultural heritage sites) for disembarked cruise tourists, recreational boaters and customers in general			✓	✓
Creation of interactive smart tools for boaters and cruise tourists to facilitate the connection between the port and the city			✓	✓
Water saving in ports, marinas and during navigation	✓		✓	✓
Strengthening the link between (small) cruising and recreational boating (yachting) through alternative business models (e.g. micro-cruising for small-scale aquatic experiences) within the same value chain	✓	✓		
Set a maximum number of cruise ships in ports			✓	
Destination and sector cooperation – assessment of economic benefits from nautical tourism to the local, regional, and national economy.	✓	✓	✓	✓
Destination and sector cooperation – assessment of social acceptance of crowding and pollution (air, noise, light, etc) caused by nautical tourism.	✓	✓	✓	✓
Destination and sector cooperation – assessment of destination infrastructure capacities to operate under increased pressures and demands (electricity grid, water supply, waste management, wastewater treatment, etc.)	✓	✓	✓	✓

HIGH-IMPACT ACTIONS:

In order to foster the transition towards sustainable and responsible tourism, the following practices are considered as priorities to be implemented, based on their high potential for dissemination and significant reduction of environmental impacts:

› **Water saving in ports, marinas and during navigation**



› **Set a maximum number of cruise ships in ports**



› **Local mobility solutions in cruise destination cities and major marinas**
(Low Emission Zones due to low-carbon transport solutions, buses transporting passengers from the port to the centre, bike-sharing systems, specific walking routes for cruise passengers)



3.4 Sustainability objectives monitoring systems

Well-organised sustainability management requires the use of tools to effectively measure and communicate the achievement of sustainability objectives ^[11]. Several ways to measure sustainability performance exist and each provides potentially useful insights for policymakers, academics, businesses and the public community ^[12]. As part of a sustainability assessment system, sustainability indicators are a powerful tool to support decision-making that fosters sustainable development and helps monitor the current status on the pathway toward sustainability. In addition, indices (as highly aggregated and synthetic information from multiple indicators) have been developed and can be used as a basis for decision-making, in particular for large-scale assessments (environmental labels, certification systems, etc., ^[13]).

Recent research on sustainability for the yachting sector, performed within the Interreg MED Project iBLUE ^[14], developed an empirical conceptualisation of sustainability indicators for this specific sector. The final list of indicators is presented within a double-fold framework on sustainability, i.e. applying the typical TBL (Triple Bottom Line) perspective (i.e., economic, environmental, and social dimensions) and an adapted operational indicator typology on the sustainability impact (input, process, output and outcome). Some sustainability indicators apply to a single specific yacht-related sub-sector (i.e. service industry, manufacturing industry and ports and marinas), while several indicators are more generally related to TBL and are important for all parts

of the value chain of the yachting industry (and therefore also for these guidelines).

As for cruising, a study by the World Tourism Organization splits the sustainability issues into two categories: ship vessels and ships' destinations (ports, cities, islands, etc.) ^[15]. Indicators for cruising can also be found in the annual sustainability reports issued by large cruise companies that use them to monitor and check their progress towards sustainability. However, these reports do not always undergo verification, fact checking or independent review.

Finally, the European Sea Ports Organisation (ESPO) monitors the sustainability of European ports that are members of the EcoPort Network, the main environmental initiative of the European port sector. ESPO's annual environmental reports (the latest in 2020, ^[16]) analyse the environmental performance of European ports based on selected benchmark indicators.

Based on the consulted references mentioned above and other sector-based sources, these guidelines offer a non-exhaustive list of possible sustainability indicators for cruising and recreational boating (Table 7). Indicators are categorised according to the sub-sector they refer to: cruising and recreational boating (as activities at sea) and ports and marinas (as shore-side activities). For each proposed indicator, the table also reports the related sustainability objectives and the main reference source. The table is meant to provide a list of possible indicators which can be used to

evaluate the sustainability of the two sectors at the scale of the Mediterranean basin or its sub-regions. It does not aim to assess the vulnerability of a single vessel or harbour infrastructure.

It shall also be noted that some of the indicators linked to recreational boating assume relevance mainly or only for the larger vessels in this sector (typically yachts).

Table 8 Proposed list of sustainability indicators for cruising and recreational boating, based on the existing literature.

SUSTAINABLE PRACTICE	CRUISING	RECREATIONAL BOATING	PORTS & MARINAS	STRATEGIC OBJECTIVE	ADAPTED FROM
% reduction (by fleet, ship) of air emissions of NO _x , Sox, based on a referenced baseline	✓	✓	✓	SO1	[14], [15]
Number of ports/marinas with on-shore electricity supply services			✓	SO1 SO2	[16]
Number of boats with electric or hybrid engines		✓		SO1 SO2	[17]
Annual electricity consumption in kWh	✓	✓	✓	SO1 SO2	[14]
% reduction (by fleet, ship) of air emissions of CO ₂	✓	✓	✓	SO2	[14], [15]
Total energy consumption	✓	✓	✓	SO2	[14]
Share of renewable sources in respect to total energy consumption	✓	✓	✓	SO2	[14]
Number of reported ballast water discharge violations (by ship, line)	✓			SO6	[15]
% of cruise ships visiting the destination with bilge water separator systems.	✓			SO6	[15]
Number of significant oil spills	✓	✓		SO6	[14]
% of cruise ships with zero discharge systems for hazardous waste in ports	✓		✓	SO7	[14], [15]
% of ships with zero discharge systems for all ship garbage in ports	✓		✓	SO7	[15]
% of recycled or renewable materials per ship	✓	✓		SO5	[14]
Extension (ha) of “no-anchoring zones” established to preserve sensitive habitats		✓		SO3 SO4	[18]
Extension (ha) of environmentally-friendly mooring (EFM) areas to preserve sensitive habitats		✓		SO3 SO4	[18], [19]
Megafauna collision events (no.)	✓	✓		SO5	[1]



SUSTAINABLE PRACTICE	CRUISING	RECREATIONAL BOATING	PORTS & MARINAS	STRATEGIC OBJECTIVE	ADAPTED FROM
% of ships with specific tools to avoid megafauna collision (e.g. REPCET tool or similar)	✓			SO5	[1]
Number of companies/marinas/ports with an environmental policy/plan/strategy	✓		✓	SO9	[14][15] [16]
Number of companies/ports/marinas with environmental certification systems (ISO, EMAS, PERS)	✓		✓	SO9	[16]
Number of ports/marinas with differentiated fees or incentives for “greener vessels”			✓	SO9	[14] [16]
Existence of an environmental training programme for port/marina employees and crew members (no. of hours, no. of participants, no. of courses)	✓		✓	SO9	[16]
Water consumption per passenger	✓	✓		SO10	[14], [16]

04 Case studies

4.1 Zoning of Portofino MPA, Italy



Case studies provide concrete examples of the implementation of a practice or a set of practices in a given place, addressing specific challenges for the sustainability of cruising and recreational boating.

Four case studies are presented here, dealing with cruise ships, recreational boating vessels, ports and/or marinas.

Practices illustrated by the case study:

- *Establish “no-go areas”, buffer zones around MPAs or specific authorisation procedures to access extremely sensitive areas;*
- *Establish no-anchoring areas to protect sensitive species and habitats (including sanctions for non-compliant anchoring);*
- *Establish speed restrictions for ships (including sanctioning systems);*
- *Allow access in ports, marinas and MPAs to boaters, charters and touring companies that provide sustainability certification for their boats and services.*

Main challenges addressed:

Safeguarding ecosystems and biodiversity; Boosting knowledge and innovation

Sustainability objectives:

SO3 SO4 SO9

Sector:

Recreational boating

Main actors:

Local authorities and MPA managers

References: Pharos4MPAs, Recommendations for Leisure boating ^[1]; [Portofino MPA website](#); Capanera, 2019 ^[20].

Located on the north-western coast of Italy (Liguria Region, Western Mediterranean), Portofino became a Marine Protected Area in 1999. It has a surface area of 374 ha of marine area and hosts about 100 ha of coralligenous and *Posidonia oceanica*, which are biodiversity targets to preserve [10]. Several ports and marinas are close to the area that is threatened by both yachting and boating pressure. Most recreational boaters in this area are daily tourists that are attracted by the wide possibilities of safe anchorage, unspoilt scenery and unpolluted waters [10]. The direct mechanical damage caused by boat anchoring called for the establishment of severe restrictions and the creation of more than one hundred eco-friendly mooring areas.

According to the MPA zoning, the following restrictions have been established for nautical activities:

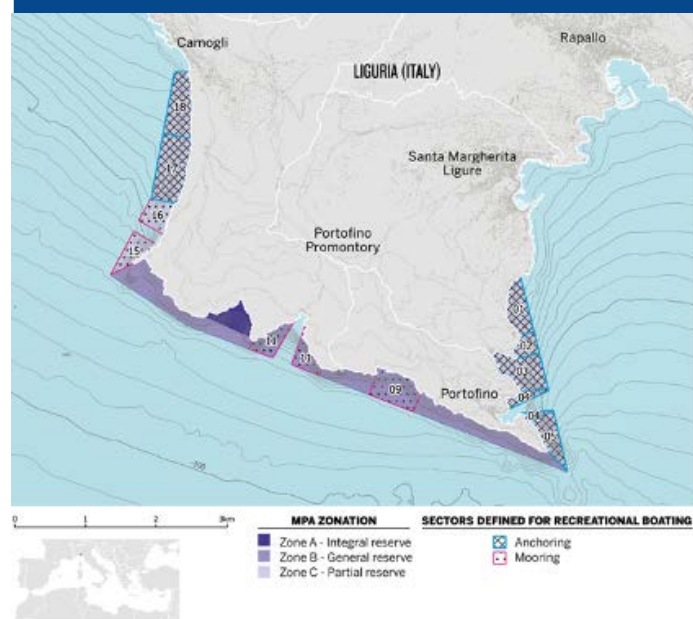
- Boats over 24 m in length (large yachts or superyachts) are forbidden throughout the entire MPA.
- Zone A is fully protected; thus no boats of any type are allowed to access this area.
- In Zone B, anchoring is forbidden. Boats are only allowed to stop in seagrass-friendly mooring fields situated in San Fruttuoso, Cala degli Inglesi and Punta Chiappa.
- In Zone C, until the identification of new mooring areas, anchoring is generally allowed, except for some areas reserved for specific activities, such as bathing or traditional fishing activities.

Some mooring areas are free, while others require a fee for their use, which increases the income of the MPA, possibly funding new initiatives for habitat protection and biodiversity preservation. The seagrass-friendly mooring fields are highly frequented by recreational boaters, showing a high social acceptance of this solution.

Moreover, in Zones B and C, navigation is allowed by rowing or sailing. Motorised navigation (at a speed lower than 5 knots) is only allowed for boats that can certify that they meet the pre-defined eco-compatibility requirements established by the MPA regulations:

- Boats equipped with sewage collection systems
- Engine compliant with Directive 2003/44/EC relating to gas and noise emissions;
- Use of no-release anti-fouling paints

Figure 5 Zoning of Portofino MPA (Italy) with reference to mooring and anchoring possibilities. Source: Pharos4MPAs [3].



4.2 Reducing CO₂ emissions at the Port of Marseille, France



Practices illustrated by the case study:

- *Electrification of ships, ports and marinas (including cold ironing for ships stationary in ports);*
- *Use of Liquefied Natural Gas - LNG (as a transitional fuel) and equip ports with the related infrastructure;*
- *Use solar panels and/or integrate photovoltaic systems into the ports and vessel's electricity grid;*
- *Tariff reduction for port use for vessels that meet severe environmental quality standards (differentiated port fees);*
- *Reward/Rating systems to facilitate the identification of greener vessels*
- *Charter of commitments to improve the environmental and social sustainability of navigation and port operations.*

Main challenges addressed:

Eliminating air emissions of pollutants and greenhouse gases; Boosting knowledge and innovation; Reducing the impact of cruise ship calls and improving the living environment of local residents.

Sustainability objectives:

SO1 SO2 SO9

Sector:

Ports, Cruising

Main actors:

Port authorities, Cruise companies, Local authorities

References: : [Port of Marseille website](#)

Marseille Fos, located on the south coast of France, is a major transit port for cruises and ferries, with a significant role in the development of tourism in the South Provence-Alpes-Côte d'Azur Region. Through regular lines, it connects Marseille to Corsica, Sardinia and North Africa (Tunisia, Algeria, and Morocco).

It was the first port in France to offer quayside electricity connections (cold ironing) for ferries to and from Corsica. Cold ironing is the process of providing shoreside electrical power to a ship at berth, while its main and auxiliary engines are turned off. The system requires electrical infrastructure both at ports and on ships. It reduces CO₂ emissions and noise emissions when the ship is stationary at the port.

The companies that are currently equipped with this infrastructure calling at Marseille Port are La Méridionale (since 2017, with three berths allowing close to 400 stopovers per year) and Corsica Linea (since 2019). The system has required significant investment, both by ship owners and the port, with the support of the government and local authorities. The electrification of cruise docks is planned for a second phase, as the technological details are more complex. However, in 2019, it should be noted that 30% of cruise ships calling at Marseille (i.e., half of the passengers calling) were already equipped with a device allowing them to connect to the quay.

Moreover, since 2019, two LNG-powered cruise ships have been calling at Marseille. With a second ship-to-ship LNG bunkering operation in June 2020, the Port of Marseille Fos confirmed its commitment to Liquefied Natural Gas (LNG) and, as a member of the Society for Gas as a Marine

Fuel (SGMF), intends to promote LNG as a solution for greening maritime transport.

The Port of Marseille Fos is also working to develop photovoltaic energy production by equipping the roofs of hangars and warehouses. With its photovoltaic roofs, the port aims to produce 100% self-generated energy, fed into the internal network. In 2017, the Port of Marseille Fos introduced the "Environmental Ship Index" awards, promoting the World Climate Initiative. This mechanism rewards ships whose sustainability performance exceeds regulatory requirements. Shipping companies receive an environmental bonus in the form of reduced port fees. On March 5 2021, the Supervisory Board of the Port of Marseille Fos approved its 2020-2024 Strategic plan. The goal is to better reconcile economic growth and environmental excellence. In order to achieve this, close to €350 million will be invested, with almost two thirds dedicated to projects for port development and one third to projects that maintain the infrastructure and assets. Energy transition is the number one priority of the strategic plan, to be achieved through the renewal of industrial facilities and technological innovation.

Finally, the local port community of Marseille adopted a first-of-its-kind, proactive approach to mitigate the impact of cruise ship calls and improve the living environment of inhabitants, gaining the direct commitment of the major cruise lines calling in Marseille. The Blue Charter Marseille Provence was launched by Marseille Provence Cruise Club in October 2019, in the context of the "Blue Maritime Summit". It was initially signed by Costa Group (Costa Cruises, AIDA Cruises), MSC Cruises, Royal Caribbean Group, Ponant, as well as the Port Authority of Marseille Fos, the French

Ministry of the Ecological Transition, Région Sud and Aix-Marseille-Provence Métropole, and has received increasing support. The Charter sets out 4 binding rules with which cruise lines must comply, going beyond the international regulations in force :

- *Join and utilise the CENAQ (shore power connection of ships at berth) project being led by the Marseille Fos Port Authority by the 2025 season*
- *Upon entry into the Marseille Fos Port Authority's river and maritime regulatory zone, manoeuvre using 0.1% Maritime Gas Oil or equivalent means such as LNG (Liquefied Natural Gas) or exhaust gas cleaning systems complying with local and international regulations (anticipating the creation of a SECA in the Mediterranean by 2025)*
- *Encourage the scheduling of port calls in Marseille by LNG (Liquefied Natural Gas)-powered vessels, with such scheduling potentially contributing to the development of a bunkering service using the LNG terminals at Fos Tonkin and Fos Cavaou*
- *Maintain a speed of 10 knots maximum within the pilot zone when entering or leaving the port.*

The enforcement of the Blue Charter is supervised by the harbour pilots and Marseille Fos Port Authority's harbour master. Findings may be reported to the Maritime Prefecture if the established rules are not complied with. Up to 13 cruise lines have signed the Blue Charter to date, accounting for 90% of cruise ship calls in Marseille. In the near future, all cruise operators calling in Marseille Fos will have to adhere to the principles of the Charter.

Figure 6 Zoning Cruise ships at the Port of Marseille. Source: <https://www.marseille-port.fr/en/responsible-port>.



4.3 Environmental monitoring on board cruise ships (Eastern Mediterranean)



Practices illustrated by the case study:

- *Engagement of cruise companies and boaters in environmental monitoring initiatives and scientific research*

References:

<https://www.cnr.it/it/accordi-partnership/documento/427/pos-cnr-xxx-16-accordo-quadro-cnr-costa-crociere.pdf>

<https://www.costacrociere.it/sustainability/magazine/sea/cnr-costa-monitoraggio-specie-marine.html>

<https://www.cnr.it/it/comunicato-stampa/6693/i-ricercatori-salgono-a-bordo-delle-navi-costa>

Main challenges addressed:

Safeguarding ecosystems and biodiversity

Sustainability objectives:

SO5

Sector:

Cruising

Main actors:

Cruise companies,
Research Institutions

A partnership between Costa Cruising and the National Research Council (CNR, Italy) was signed for the 2016-2020 period to develop activities that enhance the environmental sustainability of cruising and the protection of the marine environment. Within this agreement, a bilateral committee was

set up with the task of defining and coordinating collaborative actions. The committee included two representatives of the CNR and two representatives of Costa Cruising. With this agreement, Costa Cruising made its ships available to CNR researchers to carry out scientific monitoring activities across the

Mediterranean Sea during regular cruising activities.

As part of this partnership, in July 2017, the scientific team departed from the port of Venice reaching Trieste, Dubrovnik, Corfu, Katakolon and Mykonos, following a route that crossed the Adriatic, the Ionian and the Aegean Sea.

The activities performed on board the Costa cruise ship included the sighting of cetaceans and other species of conservation interest. Moreover, researchers carried out a visual

census of plastic marine litter, collecting waste material and recording detailed information (object type, material, dimensions, probable source of release, etc.).

During navigation, several awareness-raising initiatives were organised on the issues of tourism sustainability and on the importance of safeguarding the marine ecosystem. The CNR scientific team actively involved tourists on board the cruise ship to disseminate the results of research activities performed by CNR.

4.4 Clean Harbours - Ports Propres - EU certification for the environmental management of marinas



Practices illustrated by the case study:

- *Sustainability certifications for marinas and ports with proper control and monitoring systems*

Main actors:

Tourism operators

References:

[Ports Propres website](#)

Main challenges addressed:

Boosting knowledge and innovation

Sustainability objectives:

SO5

Sector:

Marinas

The European Clean Harbours certification (“Ports Propres”) is a certification system, based on a voluntary approach, for the environmental management of marinas. It is unique in Europe and since 2011 it has been recognised as a sign of environmental excellence in terms of environmental management of marinas. It is a five-steps process:

1. *Environmental diagnostic study*
2. *Implementation of means to fight chronic pollution (implementation of the action programme)*
3. *Implementation of means to combat accidental pollution, save water and save energy*
4. *Training of port staff*
5. *Raising awareness of port users*

After completing these steps, the marina may apply for the European Clean Harbours certification by passing an audit. Certification is conducted by an independent third party (AFNOR Certification), according to a benchmark of 17 criteria established at European level by the CWA 16987 Agreement, Certification Européenne Ports Propres (Clean Harbours Guidelines). This guarantees a total independence in decision-making and true impartiality in the award of the certification.

Since 2018, the harbours certified as Clean Harbours have had the opportunity to obtain an additional certification by demonstrating their action in favour of biodiversity. The “Ports Propres actifs en biodiversité” (Clean Harbours active in biodiversity) certification process comprises 4 steps:

1. *Biodiversity diagnosis and action plan;*
2. *Biodiversity equipment and good environmental practices;*
3. *Marina staff training and biodiversity management;*
4. *Biodiversity awareness and communication plan.*

Currently, (Ports Propres website, last accessed on 31.03.2022) there are 94 French ports certified with the Clean Harbour system and 33 ports certified as “actifs en biodiversité”. 68 additional French ports are in the process of obtaining “Clean Harbour” certification.

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Annex – Composition of the multi-stakeholder group

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